ECONOMIC GEOGRAPHY

A TEXTBOOK FOR SECONDARY SCHOOLS

NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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Geography Panel

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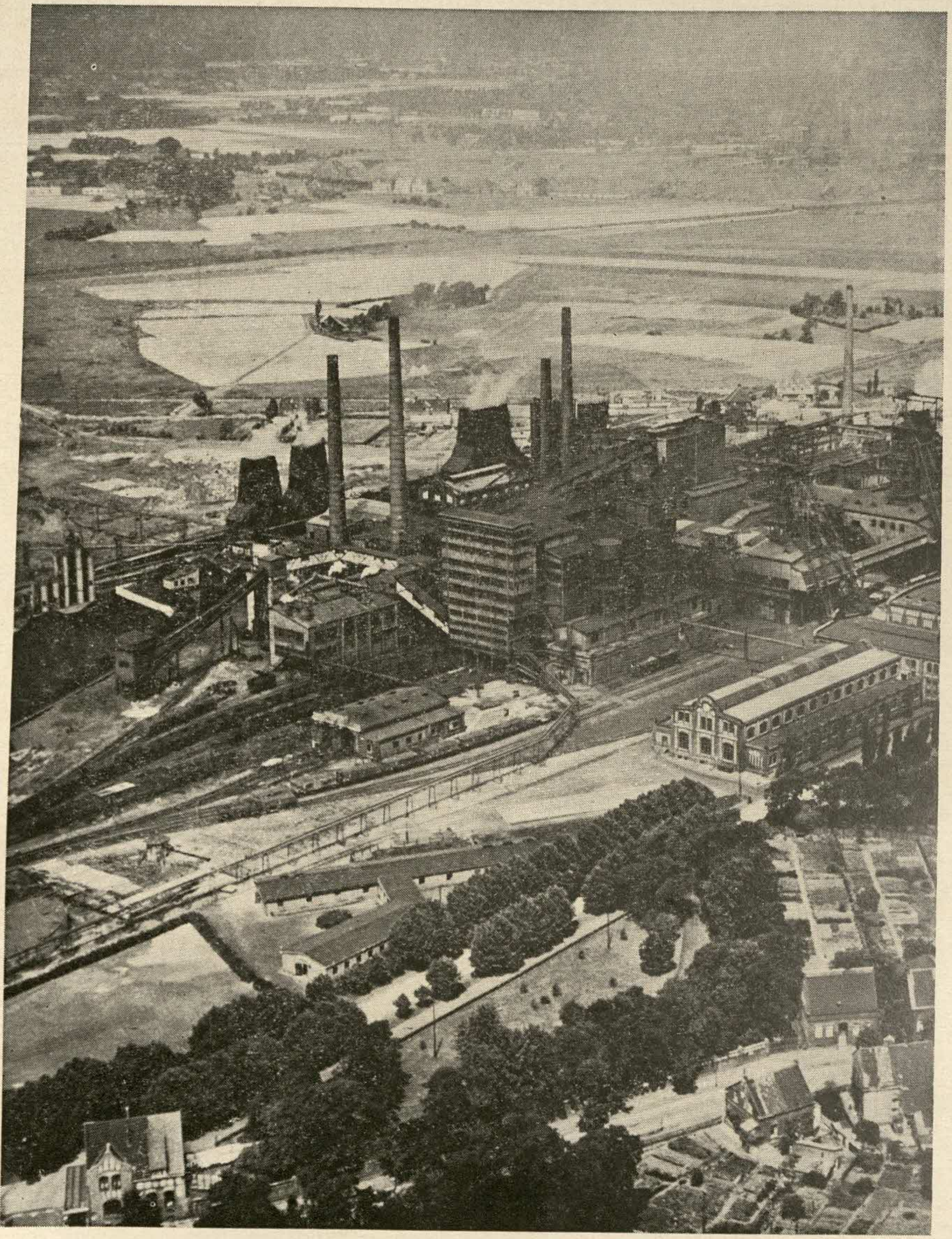

INDUSTRIAL AREA NEAR ESSEN IN RUHR (*Courtesy: Embassy of the Federal Republic of Germany, New Delhi.*)
What elements of economic geography do you see in this landscape?

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A TEXTBOOK FOR SECONDARY SCHOOLS

EDITORS
GEORGE KURIYAN
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NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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FOREWORD

This textbook on *Economic Geography* is the third of a series of textbooks in Geography for secondary schools in India. The books have been prepared by a panel of geographers under the Chairmanship of Professor George Kuriyan, Head of the Department of Geography, Madras University.

The materials have taken some time to prepare, since they imply a syllabus agreed upon by members of the Panel and then the development of a graded series of textbooks. The Panel, headed by Dr. George Kuriyan, consisted of the late Dr. S. Muzaffar Ali, Dr. R.L. Singh, Professor V.S. Gananathan, Dr. A.R. Irawathy, Dr. C.D. Deshpande and Dr. M. Shafi. Professor Ghosh and Mr. Parakh worked with members of the Panel for a period of over three years and Mr. Parakh acted as Secretary to the Panel in the development of syllabus and textbooks.

The draft syllabus was tried out with State Boards of Secondary Education, State Departments of Education and a large number of training colleges. On the basis of suggestions and recommendations received from these organizations the syllabus was finalized. Drafts of the textbooks were discussed at several seminars attended by members of the Panel, authors, reviewers, teachers and school principals and were modified in the light of collective discussion.

The last textbook in the geography series (i.e., on Regional Geography) will presently be published. The present series is part of a project undertaken by the National Council of Educational Research and Training to help to modernize school curricula and to produce model textbooks based on them, always bearing in mind the swiftly changing needs of the modern world.

The National Council is grateful to Professor George Kuriyan and his colleagues for the valuable contribution that they have made to this project. It takes this opportunity to place on record its deep gratitude to the late Professor S. Muzaffar Ali who died while working at the final seminar to revise the script of *Regional Geography*.

The Council's thanks are also due to the State Departments of Education who co-operated in having these books reviewed by competent teachers before they were finalised. Presently, the Council will bring out teachers' manuals and students' workbooks to ensure that the teacher-learning process is made more effective.

No textbook is ever final. The best textbooks are in a constant state of revision, and revision is most effective when it grows out of the experience of the practising teacher. To the practising teacher of India the Council looks for suggestions on how to improve these textbooks.

L. S. Chandrakant

PREFACE

THE world in which we live today is certainly shrinking very fast. Astronauts now circle our planet in just 90 minutes. The rapid strides made in the field of technology have opened up new possibilities in making life more comfortable and meaningful for millions of our fellow beings with whom we have to share this earth and its resources.

A systematic study of our planet, the unique physical conditions which are responsible for the evolution and sustained growth of life on the earth, its lands and peoples, its resources, and their utilization by man, is, therefore, a must for every citizen of the world.

In this context, the contribution of Geography as a discipline can hardly be overemphasized, particularly when growing cultural, political and economic ties among nations are becoming more and more intricate, promising better prospects on the one hand, and threatening the total annihilation of mankind owing to regional rivalries, ideological conflicts, and racial prejudices, on the other.

Unfortunately there are still misgivings about the very nature and importance of geography, both at the school and college levels in our country. In a large measure, the situation as it exists today may be ascribed to the lack of good textbooks. These, besides serving our own needs, may help to locate the subject of Geography in its proper place. Under the circumstances, I could not help accepting the request of the National Council of Educational Research and Training to take up this assignment.

It is, indeed, a difficult task to prepare only one syllabus and a single textbook that may serve the needs of every part of our country, particularly when there are different patterns with emphasis differing from region to region. Nonetheless, this Panel devoted much time and thought to arrive at a common syllabus and to produce a textbook that would generally be acceptable to all.

The original chapters of the book were written by Shri N. Prasad and Dr. R.N. Mathur, both from the Department of Geography, Banaras Hindu University; Shri J.B. Kumthekar, Department of Geography, Fergusson College, Poona; Shri S.C. Gupte, Department of Geography, University of Poona; Dr. M. Anas, Department of Geography, Aligarh Muslim University; Km. C. Narayanamma, Presidency College, Madras; and Shri B.S. Parakh, Senior Research Officer of the National Council, New Delhi. The chapters were written under the overall supervision of the members of the Panel at the respective places. The authors and members of the Panel spent several days in discussing the drafts of the text. Original drafts were modified in the light of the deliberations and suggestions by the members of the Panel. Criticisms and remarks that were received from experienced teachers and headmasters from time to time were also carefully looked into.

I am thankful to the members of the Panel and the authors for their cooperation. Among others, my thanks are also due to Shri M.K. Natarajan, Principal, Central School, Indian Institute of Technology, Madras; Shri M.L.

Renjen, Principal, Air Force Central School, New Delhi; Shri P.R. Joshi, Principal, Central School, Nagpur; Shri T.G. Parande of H.H. School, Nagpur; Shri A.S. Hebbar of the Indian School of International Studies, New Delhi; Shri M. Raza of Kashmir University; and Dr. U.K. Bose of the India Meteorological Department, New Delhi; for their valuable criticisms and suggestions for the improvement of these books.

Thanks are also due to Dr. E. Dayal and Shri Krishan Kumar of the Department of Human Geography, University of Delhi, who did all the cartographic work connected with these books and co-operated with me in every way. Shri D.M. Sonak prepared the pictorial illustrations. I am also thankful to a large number of agencies, Indian and foreign, for giving pictures for incorporation in the books.

To bring the manuscript to their present form involved a good deal of editorial and related work: such as selecting pictures, sketching suitable diagrams and weaving them into the text, framing exercises, and compiling appendices. I am thankful to Shri B.S. Parakh of the National Council, who rendered invaluable help to me in this task besides looking after the large amount of correspondence involved in this project. But for this help, it would not have been possible for me to bring out the book in its present form. He was assisted by Mrs. S. Goyal, Shri S.S. Rastogi and Miss Usha Malik.

I am thankful to the officials of the National Council, Shri P.N. Kirpal, Director, National Institute of Education; Shri L.S. Chandrakant, Joint Director; Shri P.N. Natu, Secretary, National Council; Mrs. Muriel Wasi, Officer on Special Duty, National Council; Dr. R.H. Dave, Head of the Department of Curriculum and Evaluation; and Professor B. Ghosh, formerly the Head of the Department of Curriculum, Methods and Textbooks, for their ungrudging help and co-operation in the execution of this project.

George Kuriyan

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TO TEACHERS

We have great pleasure in presenting to you this book which is the result of a co-operative effort on the part of several teachers both from schools and colleges. It is our earnest hope that the book would meet at least partially your own expectations and contribute to the improvement of instruction in geography in our country.

A small book such as this, which deals with a comprehensive subject like world economic geography, can hardly be complete or perfect in every respect. With the limited space at its disposal it must of necessity attempt to be selective as far as possible.

It deals with the major occupations of man and their distribution on the earth. But, while doing so, it seeks to explain why certain occupations occur at the places where they do.

The book endeavours to point out to what extent geographical environment influences economic activities of man, and how man responds differently to different environments and succeeds in partially modifying his environment, commensurate with the advancement in science and technology.

It constantly attempts to present the relevant facts in their historical perspective and to highlight certain general developmental trends observable in many parts of the world. The examples of the countries that have marched along the path of economic prosperity farther than we have, particularly during the last two centuries, should provide us with guidelines to chalk out our own future in the context of our own human and natural resources, consistent with our national heritage and ideals.

In this context, this book is a *must* for every child who will be the educated citizen of tomorrow. It gives him a spatial or world perspective against the background of which he can intelligently appreciate all our national efforts towards economic reconstruction and the relative pace at which we are marching with other countries of the world—both advanced and developing.

Our efforts at national development, again, need to be viewed as a part of the common goal of humanity to make our world a better place to live in, by waging war on want, disease and ignorance, wherever they exist on our planet. The interdependence of nations is the basic tenet on which rests our modern civilization; the world is, indeed, one and indivisible.

After the final Higher Secondary examination, many students either enter upon a career, or continue their studies in subjects other than geography. For them the book envisages a minimum measure of awareness of the problems that are going to affect their own economic, social, and political life.

For those who may feel inspired to continue the study of this subject and prepare for professions in which the study of geography is an asset, the book aims at laying a sure and sound foundation.

This viewpoint and approach pervades the whole text, including maps, diagrams, and illustrations; and is perhaps more clearly discernible in the exercises and activities suggested at the end of each chapter.

Exercises in the book are by no means devoted entirely to mechanical recall or memorization of facts. They are geared to certain widely accepted educational objectives.

In the first place, evaluation attempted through a variety of exercises has been visualized as an integral part of the process of learning itself. It aims at the revision and review of what has been learnt in each chapter. It attempts to help students in crystallizing and consolidating their ideas. Primarily, it strives to draw their attention to concepts and ideas that are basic and meaningful.

These tests aim at introducing students to proper study habits and equipping them with better intellectual skills for selecting or choosing, comparing, contrasting, discriminating, ranking, and matching. Above all, they aim at helping students to apply knowledge to new situations. Exactness or precision is their keynote.

The usual essay type tests are also equally important to provide students with the necessary opportunities to organize and synthesize their ideas around broad but well-defined topics. Here again, the emphasis should be not on length or bulk, but on logic, sequence, and pointedness. The exercises thus indicate to a certain extent what to teach, how to teach, and to what purpose.

The textbook is not an encyclopaedia, or the final word on any topic. It is only a common point of departure to enter into more specific and meaningful activities and learning experiences suited to situations that would vary from class to class.

It is from this point of view that the inclusion of a few suggested extended activities, further readings, and available audio-visual aids are to be viewed. They would be particularly useful to schools lucky enough to have these facilities and especially to those students who are better equipped to benefit from these activities, or whose curiosity has been sufficiently aroused.

Where many of these facilities are out of reach, the minimum that can be done is to encourage students to make the maximum use of the pictures, diagrams, maps, graphs, glossary, index, and appendices included in the book itself.

The core of geography lies in maps. A large number of maps, sketches, diagrams, and graphs have been included in the book. Special exercises and activities have been provided for, mainly to help students acquire the skills of interpreting them. Activities suggested such as the making of maps and cartograms, are a part of the development of these skills.

Finally, the subject of geography is required to bring the world into the classroom. The purpose of including a number of pictures in the book is, therefore, obvious. However, the actual purpose can really be served only if proper use is made of these pictures. The skills in picture reading are, in fact, as important as the development of map skills.

Any suggestions towards the improvement of the book would be most welcome.

Editors

CHAPTER 1

Nature and Scope of Economic Geography

MAN follows different occupations in order to make his living. He may be engaged in fishing, hunting, grazing, farming, lumbering, mining, or manufacturing. These productive activities of man are influenced to a considerable degree by environments. They are intimately related to the availability of natural resources or the gifts of nature. The occurrence and importance of these occupations, therefore, vary from place to place and from region to region owing to a change in environment.

Economic geography is that aspect of geography which deals with the influence of the environment on the economic activity of man. It is a study of the similarities and differences in the manner in which people make a living in different places. In other words, it tries to analyse patterns and modes of economic life occurring in different parts of the world.

Environment that influences the economic activity of man consists of two kinds of elements—physical and cultural.

A cropping pattern, for example, is intimately related to climatic conditions, relief and drainage, and soil types. These are some of the elements of *physical environment.* In most cases, the physical elements of the environment have an immediate and direct relationship with the economic activity of man.

On the other hand, the particular mode of economic activity of a place and the pace of economic growth may also be related to the elements of *cultural environment* to a certain degree. These may, to a certain extent, be described as density of population, racial traits, historical background, economic conditions, the stage of technological development of the society, and its political status and stability. These factors are also important although their influence may appear to be remote and somewhat indirect.

Thus the main theme of economic geography is the economic activity of man in its *physical* and *cultural setting.*

The subject matter of economic geography is usually approached in two different ways.

Under the first approach, all the major productive activities of man in a given region are studied systematically. Emphasis in this approach is on bringing out the individuality and activities suggested at the end of each chapter.

Exercises in the book are by no means devoted entirely to mechanical recall or memorization of facts. They are geared to certain widely accepted educational objectives.

In the first place, evaluation attempted through a variety of exercises has been visualized as an integral part of the process of learning itself. It aims at the revision and review of what has been learnt in each chapter. It attempts to help students in crystallizing and consolidating their ideas. Primarily, it strives to draw their attention to concepts and ideas that are basic and meaningful.

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Thus the main theme of economic geography is the economic activity of man in its *physical* and *cultural setting.*

The subject matter of economic geography is usually approached in two different ways.

Under the first approach, all the major productive activities of man in a given region are studied systematically. Emphasis in this approach is on bringing out the individuality of a region. This is known as the *regional approach* and is mainly of a descriptive nature.

The other approach differs from the first in so far as it concerns itself with a study of some single aspect of economic life. It deals with each of the major occupations of man separately. It is known as the *topical approach* and is largely interpretative, or explanatory in nature.

In conformity with this topical approach, each of the major productive occupations of man in its principal places of occurrence on the earth has been discussed in this book. This approach aims at making clear, for example, why certain crops grow where they do, or why certain regions are associated with certain industries.

This comparative study of distributional patterns of economic activity points out that people everywhere tend to engage in occupations that are made possible by the resources they have at hand. In this context it is often said that economic geography pertains to the study of what the earth offers to man and how man uses it.

A study of any economic activity over a period of time further points out that natural resources do not remain the same for all time; nor do man's skills or modes of work. He tries to improve his methods of work in order to produce more and better goods with a minimum of effort and time, so that his life may be more comfortable and pleasant.

Thus the nature of economic geography is essentially *dynamic*.

Natural Resources and Human Wants

Wealth supplied by Nature is known as a *natural resource*. Mineral deposits, soil fertility, timber, potential water-power, fish, and wild life are some examples of *natural resources*. They facilitate the satisfaction of human wants.

Natural resources occur everywhere in varying kinds, quantities and qualities. In most cases they become economic goods or real wealth only when man exploits them and transforms them into utilities. Thus the creation of wealth, that is *production*, is based on man's utilization of natural resources.

Man's efforts, mental and physical,—better known as *labour*—are directed towards the production of goods and services. Efficient utilization of natural resources implies a minimum waste of the resources concerned. This is particularly important because none of the resources is unlimited, even if some of them, like running water, may be replenishable.

As a result of man's technological progress, labour now can be supplemented by natural power resources. By utilizing and directing his energy through the machine, man has been able to produce tremendous quantities of goods. In fact, use of the machine coupled with power has revolutionized man's ways of producing economic goods to satisfy his growing demands.

Natural resources may be divided into four classes: (*i*) forest resources, (*ii*) animal resources, (*iii*) agricultural resources, and (*iv*) mineral and power resources.

The forests supply man with fruit, medicinal and other useful herbs, firewood, timber, tanning material, cork, resin, paper-pulp, gums and such other useful materials as rubber, cane, shellac and bamboo.

Animals provide man with a very important part of his food in the form of fish, meat, eggs and milk. They also supply hides and skins for his foot-wear and leather goods. They furnish wool and silk for his clothes and offer bones and other body remains for manure.

For agriculture, man needs land. Often land has a soil cover. It varies in quantity and quality from place to place. Some of the soils are very fertile. Soil and climate together determine what crops can be grown on the land. Climatic conditions here refer to temperature, rainfall and sunshine. In some areas rainfall is neither adequate nor well distributed for agricultural purposes and hence water is to be provided for, artificially by means of irrigation. (*See* Appendix III.)

As against this, up till now, man has not been able to modify temperature significantly, and it still plays a limiting role on agricultural activity.

Thus soil, climatic conditions, and irrigation possibilities together make up agricultural *resources.*

By digging into the earth, man obtains such useful mineral ores as iron, manganese, copper, bauxite, gold, silver, mica, and tin. Minerals like coal and oil supply power for man's industries. Some minerals like monazite contain elements like thorium and uranium which are the sources of atomic energy. Water-power which can be used to generate electricity is also an important source of power. These then are the *mineral* and *power resources* which man has at his command.

Primary Needs of Man

Man uses natural resources to satisfy, in the first instance, his *primary needs*, that is the needs of the first order. These are food, clothing and shelter.

Food—Man obtains food from plants and animals. By far the most important food obtained from plants is cereals—wheat, rice, corn, millets, oats, rye, barley, and others. They form the staple food of most peoples. Cereals are generally supplemented by various pulses like beans and grams. Fruits, various kinds of vegetables, tubers like potatoes and roots like tapioca (cassava), yam (manioc) and carrots dug out from the soil, are also used to supplement the main articles of food. Likewise, edible oils are derived from groundnut, mustard, linseed, olive, sesame, soya and coconut.

Sugar is obtained mainly from sugar-cane and sugar-beet. Raw and refined sugar and *gur* or jaggery are used in making sweets, candies and syrups.

Beverages like tea, coffee, and cocoa are also procured from plants. They are refreshing drinks. Cocoa has also a nutritive value.

Alcoholic drinks like wines, brandy and whisky are also derived from plants.

Fish constitutes an important part of the food which man gets from animals. Different kinds of fish abound in the fresh waters of rivers and lakes, as well as in the salt waters of the oceans.

The sea mammals like the whale yield a great amount of blubber which is one of the main articles of food for people like the Eskimos who live in cold lands.

Oil extracted from the liver of fish, such as the cod and the shark, is very rich in Vitamin D and consequently has a great nutritive value.

Meat is obtained mainly from cattle, sheep, goats, and pigs. Beef, pork or mutton forms the main item of food in many parts of the world.

Birds and eggs are also other items of food. Poultry farming is carried on nearly everywhere.

Milk and milk products obtained from the animals contain valuable nutritive elements like fats, proteins and vitamins. Dairying in one form or another is a time-old occupation of man.

Not all the food-stuffs, whether derived from plants or animals, are produced in every part of the world. Some areas are more suitable for producing particular foods than others. The chief factor in their production is climate, followed by other factors, such as soil and availability of labour. For example, rice is a product mainly of the hot-wet tropical climates, whereas meat and milk are the primary products of the cool temperate grasslands.

Clothing—Man obtains his clothing either from animals or from plants. Of late he has been able to produce it synthetically, that is, by chemically processing certain substances.

Animals offer him hides and skins, furs and wool. Silkworms provide him with silk. Plants supply him with cotton, flax and jute. He manufactures synthetic fibres, such as nylon, rayon, terelyne, and dacron by chemical processes.

Hides and skins are used not only by forest dwellers but also by people in polar lands who live by hunting. In polar lands the climate is so cold that the people have to use fur for their clothes. People living in high moutains also have to wear similar clothes. Hides and skins are used to make various kinds of foot-wear in almost all the countries.

Fur-bearing animals, such as the silver fox, mink, and beaver, offer furs. Furs are the prized articles in fashionable circles especially of Europe and America. The coniferous forests of the Northern Hemisphere are the home of various fur-bearing animals.

Sheep of the cool temperate climates supply long and fine wool. It is used to make warm clothing by people in cold climates. Sheep of dry and hot lands produce rough and short wool. Coarse woollen cloth and carpets are usually made out of this wool. Cloth is also made from the hair and fleece of certain animals, such as goats, camels, yaks, llamas, and alpacas.

Silkworms offer silk, a quality material, for clothing. Silk thread is often fine, strong, and durable. It is obtained from cocoons which the silkworms make around themselves. These worms thrive best on the leaves of mulberry trees.

Cotton is by far the most widely used fibre for making cloth. Several varieties of cotton cloth, whether coarse or fine, are widely used in different parts of the world. Cotton is a prized product of tropical and warm temperate climates.

Flax, jute and hemp are other plants which provide material for clothing. The stems of these plants yield thread after retting in water. Linen, coarse cloth, carpets, ropes and gunny bags are some of the important commercial products made out of them.

Man has now produced artificial silk as well. This is made by chemically processing certain materials like cellulose obtained from wood-pulp and other materials. It is cheaper than natural silk and is in great demand. Rayon and nylon are the two synthetic fibres that are becoming popular.

The clothing of people in different parts of the world depends on the climate and on the locally available materials.

Shelter—Besides food and clothing, man needs some kind of a *shelter* whether a hut, a tent or a house, to protect himself from heat, cold, rain, and wind. He requires protection from dangerous reptiles, beasts and thieves. A shelter provides him with a place where he can safely work, rest, and enjoy privacy. The caves of primitive man served these basic needs.

Like clothing, man's shelter also depends to a considerable degree on the climate, the locally available building materials, his economic condition, and the stage of his technological development.

The usual building materials are stones, baked or unbaked mud-bricks, timber and tiles or thatch. In large river plains like that of the Ganga, stone is not locally available and hence, sun-burnt or baked bricks are the most common building material. Bricks made of fine loam and baked in kilns compare fairly well with stone in strength and durability.

Thick mud-walls lend protection against both heat and cold. They are very common in lands with extremes of climate, especially so in the deserts. Houses of stones and baked bricks are more durable and safe but they are less comfortable in extreme climates. Houses made of logs or wood are common in cold lands, where wood is used even for flooring.

The very style of the roof often reflects the climatic conditions of a region. The roof is highly slanting in areas of heavy rain and snowfall. It allows rain water to drain off quickly and snow to slide off easily. In areas of scanty rainfall, the roof may be flat or terraced. It may even be made of mud as in the deserts and drier parts of India. The slanting roof is either tiled, thatched, shingled, or made of corrugated iron sheets.

Houses with large open doors and windows are common in the warmer regions. They are useful to let the cool breeze in. However, they are to be kept closed against very cold or hot winds. Glass-panes and skylights let in light but shut off wind. They are also useful in cold climates for their greenhouse effect.

In hot lands, rooms are built around an interior courtyard for better ventilation and greater comfort.

The farmer's simple hut in monsoon lands such as ours is made of split bamboo with a plaster of a mixture of clay and cow-dung. The roof is generally thatched.

The river-side huts in hot-wet lands like Malaysia are built on *stilts*, or high platforms made of bamboo and wood. The fishing boats are tied to the stilts enabling fishermen to set off quickly during high tide. (*See* picture 1.)

The round huts in the grasslands of Africa are made of mud-covered grass-walls. They have conical thatched roofs.

The desert dwellers live in mud-walled, flat roofed houses with low doors and small openings for windows to avoid the driving dust or sand. But the nomads of the desert and semi-desert areas, roaming about with their herds of animals, live in tents of coarse cloth or hides. For example, the *Kirghiz' yurt* is a wooden framework covered with cloth or hides.

The *cabin* of the Canadian lumber-jack is made of logs with the doors and windows having furs hung over them as curtains.

Just as the people of equatorial forests often live in a primitive shelter of leaves and twigs of trees, the Eskimos of Greenland and Northern Canada live in low dome-shaped shelters made of frozen snow, the only building material at hand. These ice-houses called *igloos* are made in winter when Eskimos embark on their sealing and fishing expedition on the frozen Arctic Sea. The interior of an igloo with its low entrance is fairly warm and comfortable as compared to the extreme cold outside. Warmth is obtained by burning fish oil. (*See* picture 2.)

When the snow begins to thaw in spring, Eskimos have to give up their igloos and to stay in small tents made of seal skins. These summer tents, known as *tupics*, are supported by rough poles of drift-wood. (*See* picture 3.)

The common Japanese house is a single storey, light wooden shelter. Its light structure is highly important in a land frequented by earthquakes. Nowadays, the modern multi-storeyed buildings in cities like Tokyo are specially designed concrete structures that can withstand the earthquake shocks.

The modern reinforced concrete buildings do not depend much on locally available material. Swift and cheap transport facilities have brought about this change particularly in the economically advanced countries. The needed cement and iron are quickly brought from far-off places by modern means of transport. In fact, the introduction of cement has revolutionized the construction of houses.

Today, air-conditioned buildings or structures made of hollow concrete blocks represent a landmark in man's constant struggle against the rigours of climate.

The modern *trailer* attached to a motor car has all the necessary conveniences of a house and can be parked in *trailer parks*. They are found mostly in the United States of America and Canada. These trailer parks supply gas, water and electricity. Thus a trailer is a mobile house and is yet another feature unknown in the past. (*See* picture 4.)

Modern man thus tries to depend less on nature for his shelter as for other aspects of his life. He tries to devise materials and methods that enable him to live in greater comfort.

EXERCISES

Review Questions

1. Answer the following questions:
    - (*i*) Distinguish between productive and unproductive occupations, giving three examples of each.
    - (*ii*) Define natural resources and state with reasons whether it is correct to say that they are the same as elements of environment.
    - (*iii*) Why is clothing taken to be one of the three primary needs of man? What are the other two primary needs?
    - (*iv*) Compare and contrast regional and topical approach to economic geography.
2. Define economic geography and explain its scope with suitable examples.
3. Why is economic geography considered *dynamic* in its nature? Give examples from the economic geography of India.
4. Give three examples from world geography to indicate that natural environment puts severe limitations on man's activities. Then give the same number of convincing illustrations to show that man, too, with his high technical development overcomes the limitations placed on him by natural environment. Of the two sets of illustrations which one appeals to you most?
5. State the four broad categories of natural resources and classify the following accordingly:
    - (*i*) Ivory
    - (*ii*) Marble
    - (*iii*) Ebony
    - (*iv*) China clay
    - (*v*) Mica
    - (*vi*) Running water
    - (*vii*) Fur
    - (*viii*) Resin
    - (*ix*) Silk
    - (*x*) Lac
    - (*xi*) Salt
    - (*xii*) Lignite
    - (*xiii*) Kerosene
    - (*xiv*) Chernozem
    - (*xv*) Fleece
    - (*xvi*) Karakul
6. Given below are a few typical shelters found in different parts of the world. Re-arrange them geographically in order of climates starting with the equatorial type and ending with the polar:
    - (*i*) Mud-covered grass huts with conical roofs.
    - (*ii*) Cabins made of logs and with windows covered with fur curtains.
    - (*iii*) Houses built on stilts.

(*iv*) A wooden framework covered with cloth or hides.
(*v*) Igloos made of ice blocks.
(*vi*) Mud-walled, flat-roofed houses.
(*vii*) Tents supported by drift-wood and covered with sealskins.

7. Listed below are certain environmental factors that influence agricultural production in India. Classify them into physical and cultural environment and state which factors in your opinion are more responsible for our less spectacular progress in this field:

(*i*) A prolonged dry spell.
(*ii*) A high density of population.
(*iii*) Scarcity of fertilizers.
(*iv*) A large number of draught animals on the farm.
(*v*) The vagaries of the monsoons characterized by occasional floods and famines.
(*vi*) A high percentage of population depending on land for a living.
(*vii*) A large variety of soils.
(*viii*) Increasing irrigational facilities in some areas.
(*ix*) Concentration of rainfall over a small part of the year.
(*x*) Use of primitive tools and farm practices.
(*xi*) A slow pace of land reforms through legislation.
(*xii*) A growing season almost all the year round.
(*xiii*) Very small and fragmented land holdings.
(*xiv*) A contented outlook of a large number of farmers.
(*xv*) A national urge to be self-sufficient in food.

Finding Out

(*i*) Find out from your own neighbourhood some of the local natural resources that are being exploited now but were not used some ten years before.

(*ii*) List those resources that are now exploited more efficiently and are being put to more productive use.

(*iii*) Are there any natural resources that have been recently exhausted, or are being used rather ineffectively?

(*iv*) Is the cultural landscape in your neighbourhood changing? What are the major changes that have come up during the last ten years, or are still coming up? Have these changes made any impact on the life of the people?

Cartographic Work

On an outline map of the world, draw pictures of typical shelters found in different parts of the world. Write a suitable title and a brief note explaining the pictorial map.

Picture Reading

1. Study carefully the picture of houses on stilts and that of an igloo. Compare the life of the people living in these shelters. Despite the great diversity, what points of similarities do you notice in the lives of men living at the two extremes of climate?
2. Comment on life in a tupic and in a trailer, both of which are mobile shelters.

Films Available

i. Shelter. No. 728; 11 mins; English; D.A.V.E.
ii. Clothing. No. 677; 9 mins; English; D.A.V.E.

Further Readings

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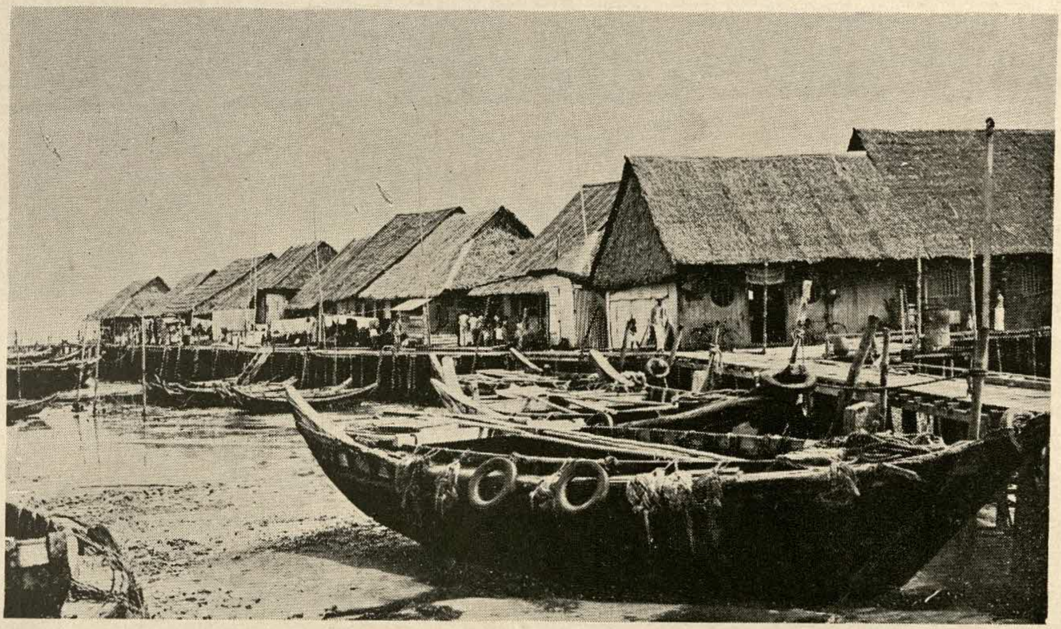
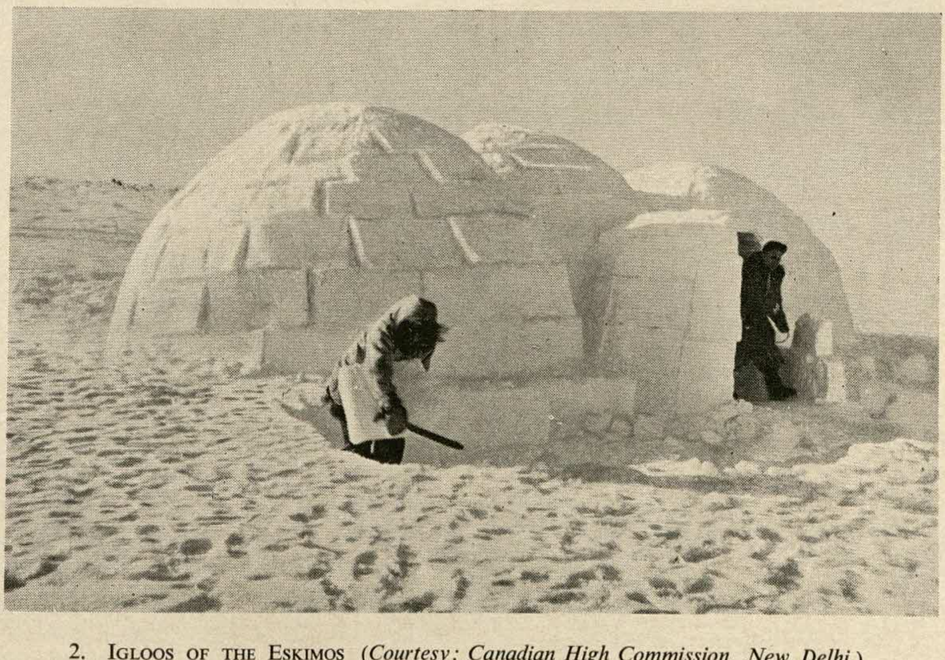


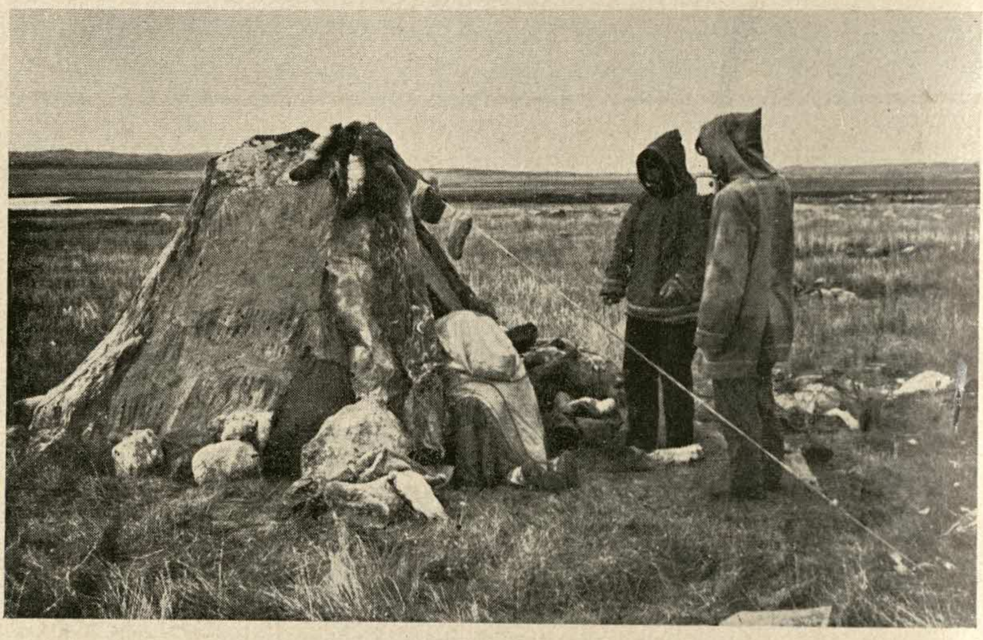
1. HOUSES ON STILTS (*Courtesy: Malaysian High Commission, New Delhi.*)

This is a fishing village in Malaysia comprising houses built on stilts. When the sea is at high tide, the water rises close to the floor of the houses. Fishing boats tied close to the houses make it easy for the fishermen to set-off on the sea for fishing. Note the material used in building these huts and the highly slanting nature of the roofs. What do they suggest?



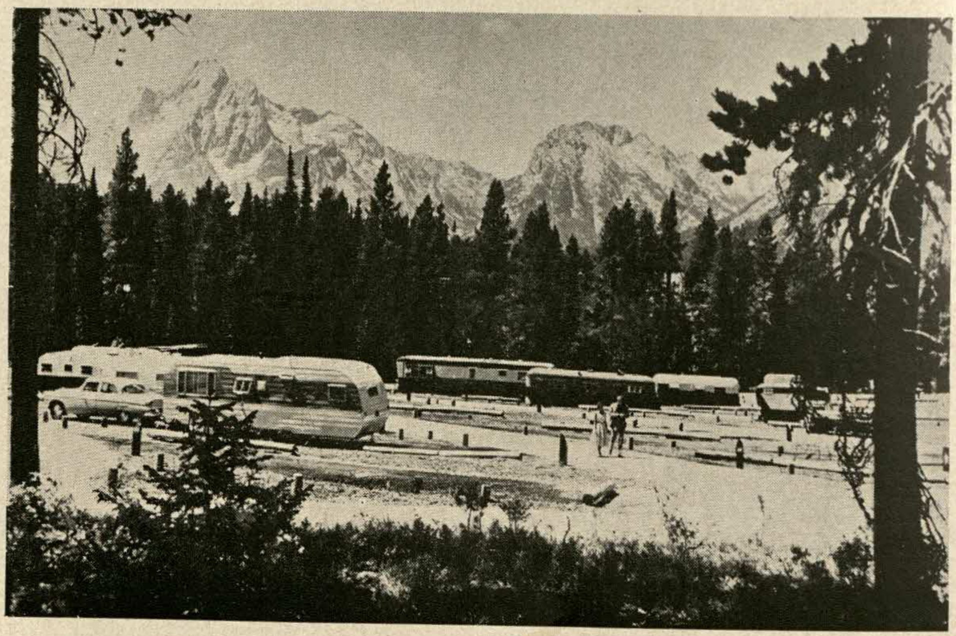
2. IGLOOS OF THE ESKIMOS (*Courtesy: Canadian High Commission, New Delhi.*)

A ceremonial igloo is being built by the Eskimos in the North-West Territories of Canada. These dome-shaped winter houses of the Eskimos are made of frozen snow. They are built on sea-ice when the Eskimos embark on their fishing and sealing expedition on the Arctic Sea. How do these snow-houses protect them from cold?



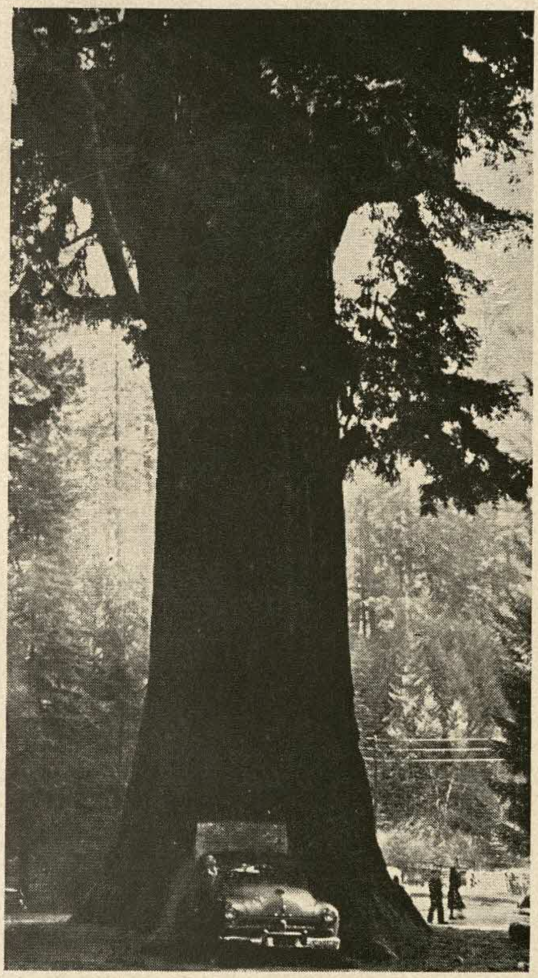
3. A Sealskin Tent (*Courtesy: National Film Board, Canada.*)

The Canadian Eskimos return to these barren lands from the Arctic Sea in summer. They stay in a summer tent called tupic. It is supported by rough poles of drift-wood and covered with sealskins held down by boulders. What natural resources do you see in the picture which the Eskimos exploit to earn their livelihood?



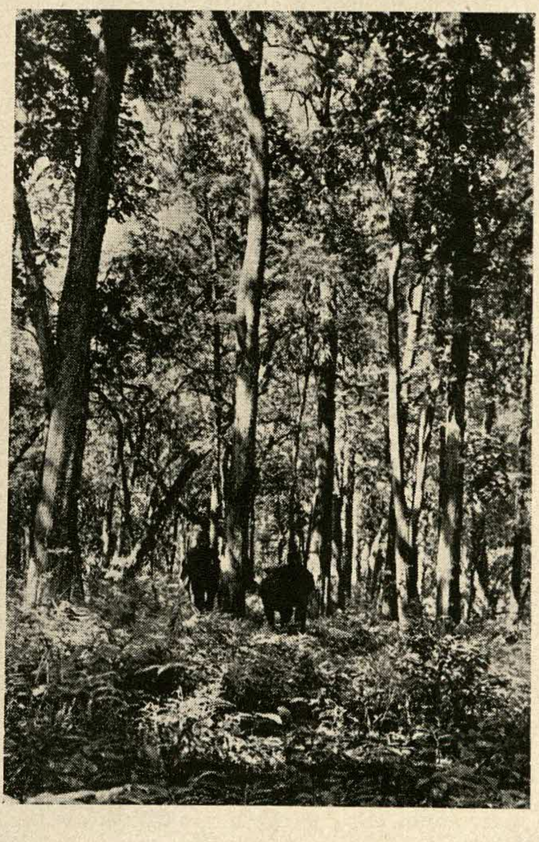
4. Modern Trailers (*Courtesy: U.S.I.S., New Delhi.*)

These trailers are parked in a tourist centre in the United States and are provided with electrical and plumbing connections. This mobile shelter with almost all the necessary conveniences of a house is attached to a car and can be parked in any trailer park. Compare this mobile house of a modern man with that of the Eskimo, in regard to their purposes and comforts.



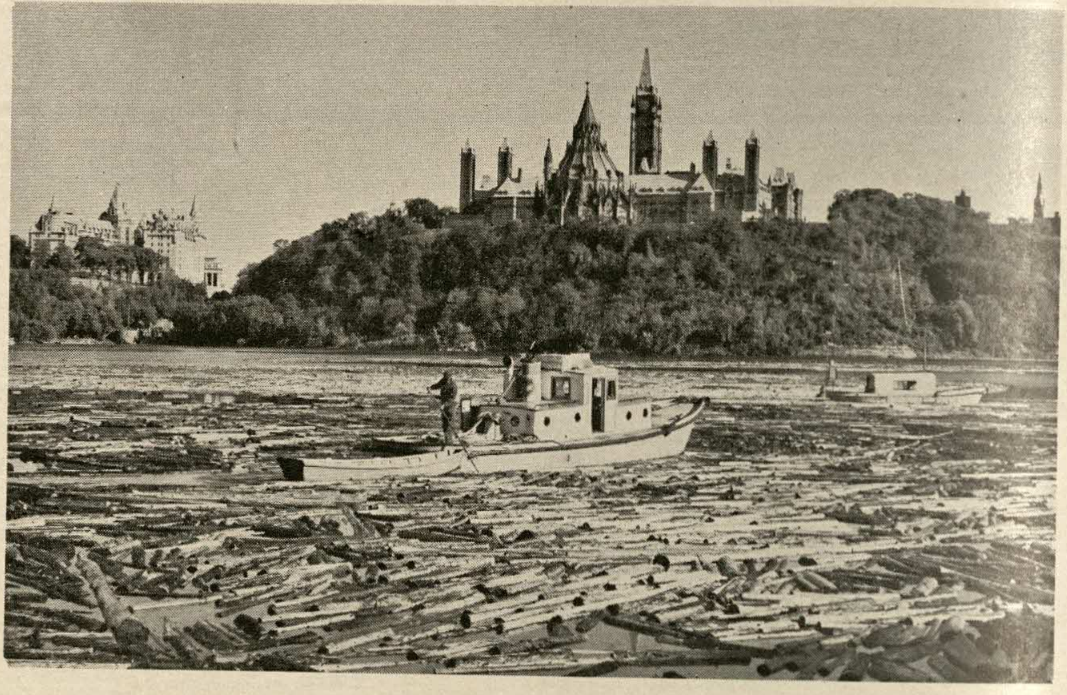
5. THE GIANT REDWOOD TREES (*Courtesy: U.S.I.S., New Delhi.*)

Found within 40 *kilometres from the ocean where there is always moisture-laden air, they are restricted to an altitude of* 1050 *metres only. These gigantic conifers are found in the States of California and Oregon. This tree, with a diameter of about* 8 *metres at its base is about* 68 *metres high. Weighing about* 4000 *tons, it may be as old as* 2000 *years. How is the age of a tree determined?*



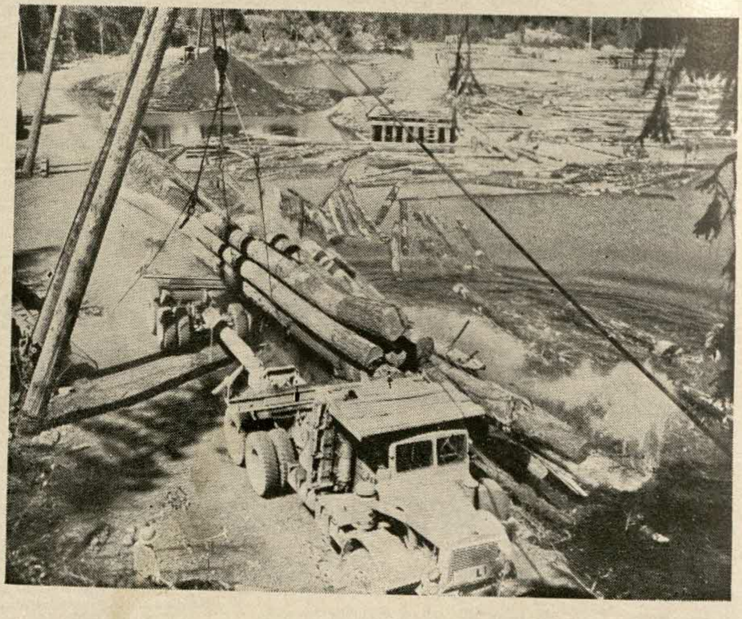
6. THE MALABAR TEAK FOREST (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

Teak is the most important tree often mixed with other species of the monsoon forest. It belongs to a moist deciduous type and is confined to a region with a rainfall of 100 *to* 200 *cm. and characterized by long dry-spells. Note the tall, straight trunk of the trees and the thick undergrowth. How tall are the trees?*



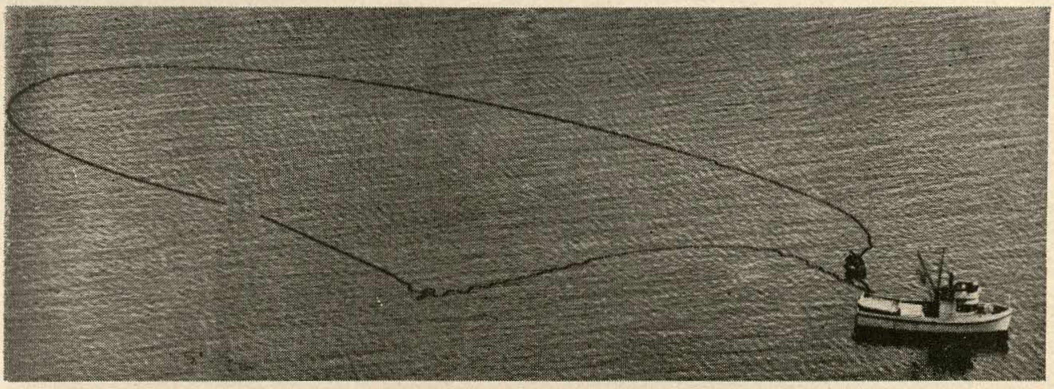
7. LOGGING OPERATION ON THE OTTAWA RIVER (*Courtesy: National Film Board, Canada.*)

The word 'logging' stands for both cutting trees into logs and hauling them over water. The buildings in the background are the Houses of Parliament of Canada, and an old castle. What is the job of the man standing in the boat?



8. A LOG DUMP AT VANCOUVER (*Courtesy: National Film Board, Canada.*)

British Columbia accounts for more than half of Canada's lumber output. The oversized truck in the picture carries 200 tons at a time. How and where are these logs being dumped and why?

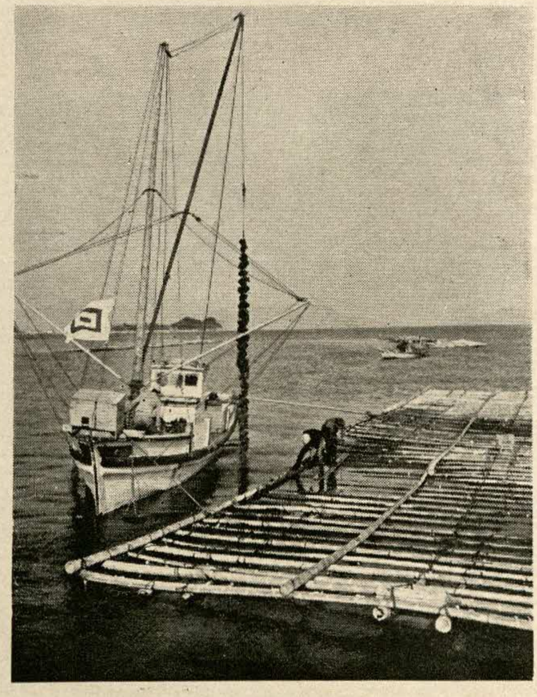


9. A Salmon Seine in Alaskan Waters (*Courtesy: U.S.I.S., New Delhi.*)

King Salmon accounts for nearly 90 per cent of Alaskan fish catch by value. Is the fishing boat a trawler or a drifter?

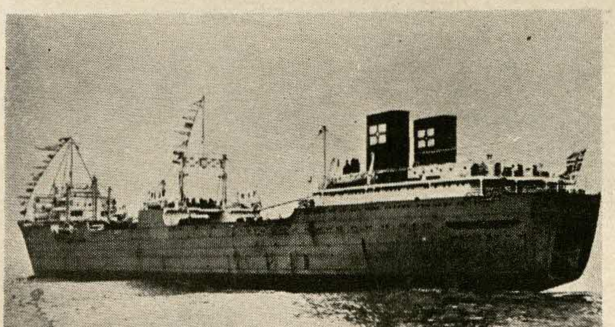
10. Trawling in the North Sea (*British Official Photograph: Crown Copyright reserved.*)

Hauling in the rich harvest of the sea near Dogger Bank. Grimsby in the United Kingdom is claimed to be the largest fish market of the world. What makes it so?



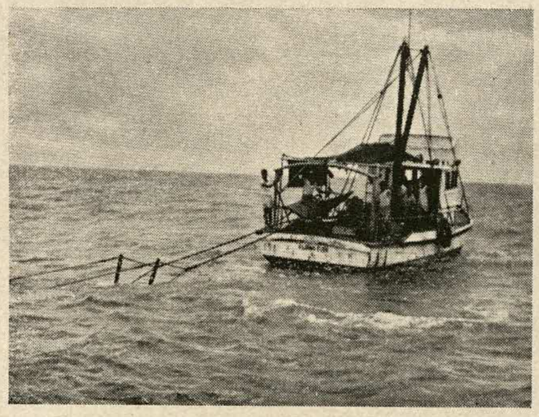
11. An Oyster Farm (*Courtesy: Japan Information Centre, New Delhi.*)

Look at a string of delicious oysters caught by the fisherman. What suggests to you that it is a fishfarm?



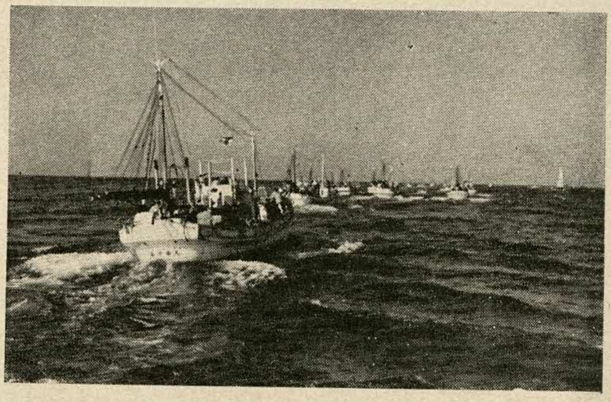
12. A Norwegian Whaler Kosmos V. (*Courtesy: Royal Norwegian Embassy, New Delhi.*)

Norway dominates the world's whaling industry. Its whaling ships span the South Sea near the Antarctica. Why is a whaler like this called a floating factory?



13 and 14. INDIAN TRAWLERS ON THE OPEN SEA (*Courtesy: Central Marine Fisheries Research Institute, Mandapam.*)

These two mechanized fishing boats represent stages in the operation of a trawl net, off the shore of Kerala. Which varieties of fish do you expect these fishing boats to catch?

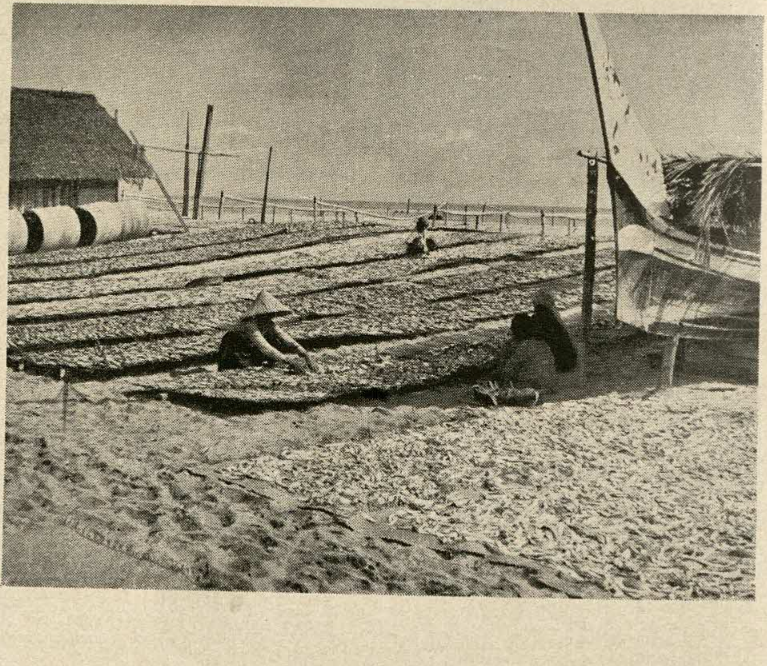


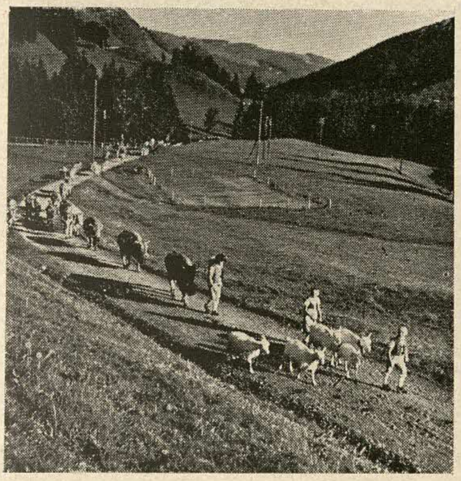
15. JAPANESE FISHING FLEET (*Courtesy: Japan Information Centre, New Delhi.*)

Boats of a mackerel fishing fleet head for fishing grounds from Choshi Port east of Tokyo. Why is Japan called a nation of farmers of the sea?

16. DRYING FISH (*Courtesy: Malaysian High Commission, New Delhi.*)

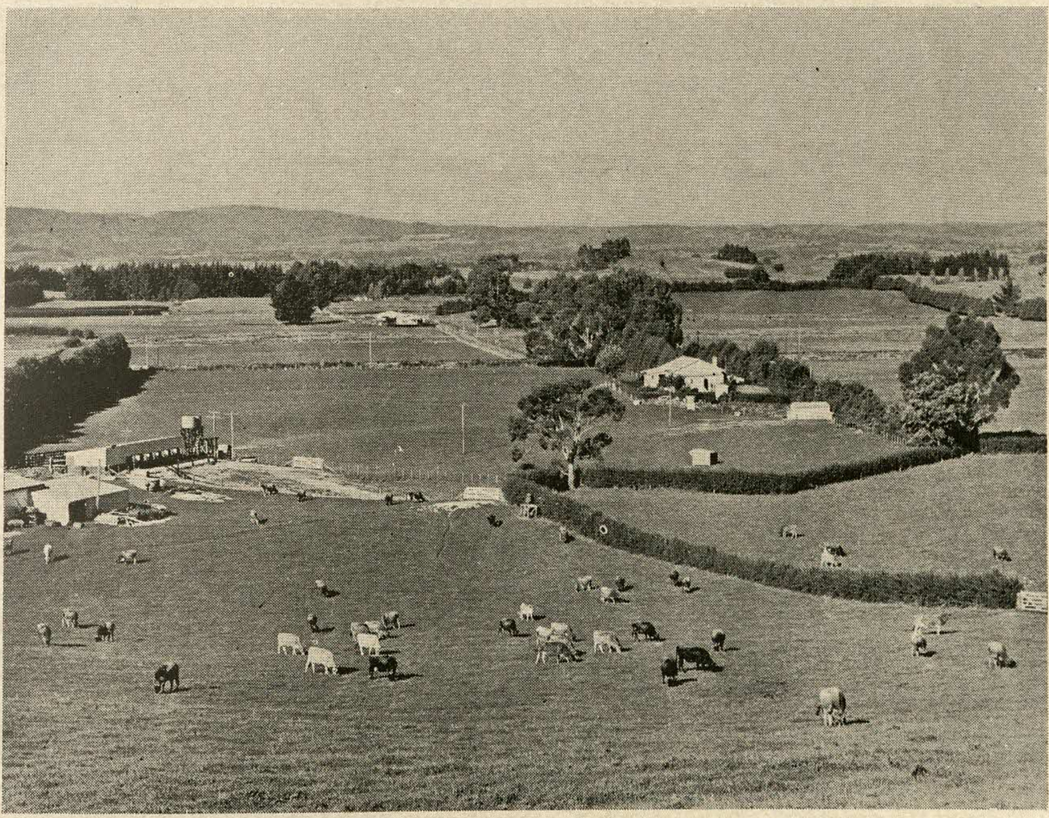
Salt fish are being dried in a fishing village of Malaysia. Mark the sloping thatch and the conical hat. What do they indicate?





17. TRANSHUMANCE IN SWISS ALPS (*Courtesy: Embassy of Switzerland, New Delhi.*)

These high meadows or 'alps' have lent their name to the famous mountain of Europe. With the coming of spring, herdsmen move with their flocks and herds up the mountains to chalets and huts among the meadows bustling with flowers. They spend the summer caring for the cows and making cheese and butter before retiring to the valley bottom in September. Do you think transhumance is a nice adjustment to seasonal changes in climate and vegetation? If so, why?



18. A DAIRY FARM IN NORTH ISLAND OF NEW ZEALAND (*Courtesy: New Zealand High Commission, New Delhi.*)

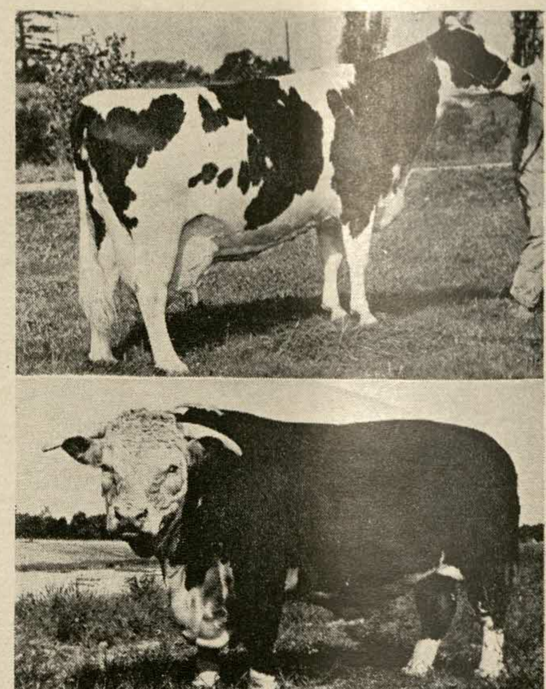
A typical dairy farm and a homestead in northern New Zealand. Cattle in the picture are Jersey breed. The country is the largest exporter of dairy produce. It produced 213,000 *tons of butter and* 101,000 *tons of cheese in the year* 1961. *How do these pastures differ from the Swiss meadows and the Australian grasslands?*

19. RANCHERS DRIVING HERD INTO CORRAL (*Courtesy*: *U.S.I.S., New Delhi.*)

The mounted cowboys are driving cattle in the corral, a place for sorting, branding and breeding animals. In the fall, they round up cattle which have been feeding on range grass. After sorting they would be sent to the cornbelt before sending them to a slaughter-house. Why?

20. CATTLE IN A RAILWAY STOCKYARD (*Courtesy*: *U.S.I.S., New Delhi.*)

The cattle are ready for being moved in large numbers by railway trains. Do you think that this movement of stock by railway would be economic? Why?



21. THE HOLSTEIN COW AND THE HEREFORD BULL (*Courtesy*: *U.S.I.S., New Delhi.*)

The Holstein cows on an average give more than 3,172 kilogrammes of milk a year. The Hereford bull is reared and fattened for its quality beef. These prized dairy and beef cattle are a result of research and development. How do these animals compare with some of the best cattle breeds in India?

CHAPTER 2

Gathering and Hunting

ONCE upon a time, long before the dawn of civilization as we know it today, man lived almost like an animal. He took shelter in caves or hollows of trees, wandered to gather fruit, hunted animals and fish for food, and perhaps wore no clothes. But he had greater inquisitiveness and intelligence than any other animal. By using these natural gifts he has passed from the animal stage to what he now is, through a slow process of development in several stages.

Occupations of Man as Stages of His Development

Imagine the joy of the early man when he first learnt the use of fire not only as a source of light and warmth during dark and cold nights but also for defence against wild animals and later on for roasting meat!

He invented the spear, the axe, and the bow and arrow which made hunting easier.

Gradually he succeeded in domesticating some wild animals. From the primitive stage of a gatherer and hunter he passed on to the stage of a herdsman, when food was always at hand. He learnt to milk the animals he had domesticated. He continued to search for the eggs of birds. He also learnt to weave the hair and wool obtained from animals into coarse cloth. He, however, still continued to lead a nomadic life as he had to wander from place to place in search of pasture for his herds.

We do not know exactly how and when man turned from gathering and hunting activity to pastoral activity; nor do we know how and when he turned from pastoralism to agriculture. Perhaps he observed tender plants sprouting from seeds which accidently fell on suitable ground. Taking a cue from this wonderful phenomenon, his curiosity must have prompted him to sow seeds purposely and watch the results. How elated he must have been to see young plants shooting forth from muddy ground!

Sowing seed in the proper season, preparing the soil before sowing, tending the young plants and protecting them against pests and animals and finally, harvesting the fruit of his patient labour—all the skills came to him in due course as a result of patient experimentation, perhaps spread over scores of centuries.

Man gave up his wandering or nomadic

way of life and became a settled agriculturist. He began to use a variety of materials like cotton and silk for his clothes and built better houses with stone, bricks, and thatch or tile.

Now that he had greater leisure at his disposal he could afford to think about religion, philosophy, law, and government. Thus culture was developed in due course.

For thousands of years man remained an agriculturist producing just sufficient for his own needs. This, however, did not preclude him from bartering his marginal surplus in exchange for some other articles of daily need which he could not produce himself.

Then, only very recently, came the major turning point—the Industrial Revolution. He invented machines and discovered materials like coal and oil which supplied power to run them. Factories produced vast quantities of goods of uniform type and quality; and traders made fortunes out of them.

The simple pattern of life, producing just enough to meet one's own demands changed a good deal. Before the Industrial Revolution it took as many as eighty-five persons to produce enough food and other bare necessities for every hundred people; but today in technologically advanced countries even as few as ten persons produce much more food than what a hundred can consume.

This created conditions of leisure and an opportunity to devote more time to thought and learning. Man used this leisure to make great strides in the physical and social sciences such as medicine, law, polity and education. This is the present industrial stage of development.

This does not mean that all over the world man completed one stage and then entered the other. In fact, we find man in all these four stages even today in some part of the world or the other. Sometimes, he is concurrently in more stages than one. What is more, the activities of gathering, hunting, grazing, farming and mining are practised in different parts of the world both as a subsistence and as a commercial type of activity.

The subsistence activity or living is one in which a man produces goods not for sale or trade but mainly for consumption in his own household. It is the opposite of commercial activity, where there is a premium on large-scale production mainly for sale or trade.

Gathering

This simple activity is connected with forests. Man collects fruits, roots and plants for food, and the barks, leaves or grasses for his clothing. He gathers bamboo, twigs and timber for his house, and medicinal herbs for treatment of diseases or wounds. He also collects firewood for his domestic fuel. This is *subsistence gathering*.

Man is also engaged in *commercial gathering*, when he intends to sell or barter the forest produce.

Coconuts are gathered on tropical coasts for the kernel and husk they yield. The monsoon forests give a variety of fruits like the mango and the tamarind. The Brazil-nut of the Amazon basin and adjacent lowlands is a luxury food. The ivory-nuts of Central and South America are used to make buttons. Leaves of yerba mate—Paraguay tea—are used as a beverage. They are found in Brazil, Paraguay and Argentina.

Various gums are collected from trunks of trees and used in industries, or in foods. Asafoetida from Afghanistan and adjacent area, chicle, the base for chewing gum, from Brazil and the *babul* gum from India, are some examples. *Lac* derived from certain forest insects is collected in the forests of India and Thailand. After processing, it is used in the manufacture of varnishes, and for purposes of sealing as well as electrical insulation.

Leaves of certain palms and plants like *sisal* are used to make mats, hats, containers,

and the like.

Roots, barks, leaves, and fruits of certain trees, and herbs in tropical forests yield drugs like *sarsaparilla*, quinine, and camphor. The various herbs used in the indigenous systems of medicine in our country are collected from forests.

The sap or juice obtained from the trunks of certain trees in South America and in West Africa yields *wild rubber*. A similar substance, *balata*, is used to insulate cables under sea and for machine belting. Sugar is made from the sap of maple trees of temperate forests.

Nuts of the oil-palm in Nigeria, Congo, and other areas in tropical West Africa are gathered and exported in large quantities for oil which is used in making soap, candles, glycerine, margarine, and other products.

Tanning material is obtained from tropical trees like mangrove, acacia, babul, myrobalan, quebracho, wattle and other trees in South America, Africa and South-East Asia and from hemlock, oak and chestnut of the temperate forests of Canada, the United States of America, Germany, France, and other European countries.

The cork oak of the Western Mediterranean Regions especially of Portugal, Spain, France, Italy, and North-West Africa yields cork from its bark.

Resins from several varieties of pines are used in obtaining turpentine which is very useful in the preparation of paints, varnishes, and many chemicals. They are collected in India (in the Himalayan forests), the United States, France and other countries.

Plantations of coconuts, palms, rubber, camphor, cinchona, pines and oaks have been developed from the gathering activities in many countries.

Lumbering

By far, the most important activity connected with forests is lumbering. A *forest* by definition is an extensive plant society of shrubs and trees with closed canopy having the quality of self-perpetuation. It is the quality of self-perpetuation which adds to the significance of lumbering as an economic activity and raises the importance of *forestry* as a science and art of farming, cultivating and managing forests and the growth of timber.

Timber which is the most important product of the forests is generally classified into two categories *hardwood and softwood* (Fig. 1).

Hardwood—It is derived from tropical rain forests of Africa and South America, monsoon forests of Burma, Thailand, Indo-China and India, and from some of the temperate forests.

The important varieties of the tropical hardwood are mahogany, ebony, rosewood, greenheart and ivory wood. Mahogany is the most important timber of the tropical lands. It is invariably hard, strong and durable.

Teak is the most valuable timber of the monsoon forests. It is highly useful in building ships, doors and windows of houses and furniture as it contains an oil which acts as a preservative. Sal is another variety of timber obtained from the mixed monsoon forests. (*See* picture 6.)

Oak, birch, maple, chestnut, ash, elm, and beech are the leading varieties of hardwood of the temperate forests.

Jarrah and karri are yet another variety of hardwood of the Western Australian temperate forests.

Hardwood is used for building houses, ships, and luxury furniture. Jarrah and karri varieties of hardwood are specially used as railway sleepers.

It may be remembered that all the varieties of hardwood belong to broad-leaved deciduous trees.

Softwood—The softwood is derived from coniferous trees of the cool and cold temperate forests which are found almost exclusively in the Northern Hemisphere. Douglas, fir, varieties of pine, red cedar, hemlock, spruce, larch, and the gigantic redwood of California are some of the important trees of coniferous forests yielding softwood. (*See* picture 5.)

In the world market softwood is in great demand as it is used for a variety of purposes, such as building of houses and ships, making plywood, matches and pencils, and preparing pulp for paper and synthetic fibres.

The exploitation of tropical forests is not an easy task. The astonishing multiplicity of species presents a major handicap to their economic exploitation. The rapid undergrowth in these thick forests, where trees vie with one another for sunlight, makes the task of lumbering still more difficult. In many places, elephants serve as the only convenient means of transport for carrying heavy logs from one place to another. It takes about four years for the teak to reach the foreign market after felling. (*See* picture 6.)

Temperate forests are more homogeneous and have very few varieties. These extensive coniferous forests in cool temperate climates make the lumbering operations relatively easy and economic because of their uniform growth over large areas. Rivers are found highly useful in these areas to carry the logs downstream. (*See* picture 7.)

The greatest lumbering activity is carried on in the coniferous forests of Canada and the United States, especially in the province of British Columbia and the States of Washington and Oregon. (*See* picture 8.) It is also important in the Scandinavian countries and in the northern parts of the Soviet Union. Exploitation of the large reserves of the Soviet forests awaits further development of means of transport. (*See* Appendix II.)

Firewood and charcoal are the other forest products that are in great demand as domestic fuel in areas where power is yet scarce and costly.

Hunting and Fishing

Subsistence hunting and fishing very often go together as they supplement each other. In some cases they are accompanied by gathering and in warm rainy parts by a crude form of farming, especially what is known as the shifting agriculture.

Hunting and fishing represent perhaps the oldest occupations of man taken up by him to meet his basic needs of food, clothing, and shelter. The adjustment of man to his environment is direct and rather simple wherever he is engaged in subsistence hunting and fishing.

As a rule, subsistence hunting and fishing do not foster dense settlements. These occupations are carried on by several tribes in vast areas supporting only a small fraction of world population. Permanent shelters or settlements are rare, since people have to follow seasonal and periodic movements of the animal life on which they depend. (*See* pictures 2 and 3.)

The people of the tundra, especially the Eskimos, live entirely by hunting and fishing. The Eskimos are well known for their skilful and ingenious methods. The Eskimos hunt seals, walruses, polar bears, and birds and catch a variety of fish. Their dog teams are very useful to them. Nowadays, they use firearms and motorboats in place of their spears, harpoons and *kayaks*—their row boats.

The people of the Taiga lay traps and hunt wolves, foxes, bears, beavers, ottors, sables and other fur-bearing animals in winter, when the animals migrate southward and grow thick fur. The reindeer and caribou also migrate with the seasons. They are hunted as well as herded. The trappers exchange furs for food-stuffs, firearms, ammunition, clothing, and other necessaries of life. Fishing becomes possible further north, only when the tundra ice thaws in summer.

The systematic development of organized reindeer farms in the Taiga regions of Alaska, Canada and Siberia is another landmark in animal herding and controlled hunting.

Hunting and fishing are looked upon as sport almost everywhere.

Most of the progressive countries have restricted indiscriminate hunting and fishing through legislation in order to save the wild life from total extinction.

Commercial Fishing—Man from the earliest times has been using fish for food. In course of time he gradually developed methods of fish preservation such as drying, salting, smoking, canning, ice-cooling and refrigeration. This made it possible for him to supply fish in large quantities to distant markets, and this in turn led to the development of commercial fishing.

Commercial fishing varies in nature from place to place in its methods, intensity of development, and the variety of catch. On the basis of location alone, fishing is divided into three categories—fresh-water, coastal and open-sea fisheries.

The catch of the *fresh-water fisheries* includes the fish that spend their entire life in rivers or lakes and those that migrate seasonally into coastal rivers from salt waters.

Important fresh-water fisheries are generally confined to large lakes and river systems in the densely populated regions. The Great Lakes of North America, the rivers of West Canada and the North-West United States which are well-known for salmon fish, the rivers of the South-East Europe, the inland fisheries of China and those of Bengal in India are some examples of fresh-water fisheries.

The *coastal fisheries* are significant along nearly every inhabited coast. The development of coastal fisheries generally depends on nearness to areas of dense population, shallow waters, availability of abundant *plankton*—the food for the fish—and coastal indentations with good fishing harbours. The coastal waters opposite the deltas of big rivers in South-East Asia are good fishing grounds as they fulfil most of these conditions. (*See* picture 16.)

Open-sea fishing on a large scale is carried on more in the temperate and cool climates than in the tropical for various reasons. Open-sea fisheries are also known as *bank fisheries.*

The important bank fisheries of the North-East Atlantic are located from the Bay of Biscay in the south to the White Sea in the north. The well-known Dogger Bank in the North Sea lies at the centre of this region. (*See* picture 10.) The shallow seas around Iceland are another fishing ground of this region (Fig. 1).

The next in importance are the fisheries in the North-West Atlantic Ocean. They are off the coasts of New England in the south and Labrador in the north. The Grand Bank is the most important fishing ground of this area.

The third important fishing area is in the North-West Pacific Ocean off the coasts of China, Japan and Kamchatka. (*See* picture 15.)

Yet another important fishing area is in the North-East Pacific Ocean off the coasts of California in the south and Alaska in the north.

A variety of factors are responsible for the development of great open-sea fisheries.

In the first place the fishing grounds are confined to broad continental shelves and extensive shallow banks such as the Dogger Bank (7 to 17 fathoms deep), the Grand Bank (7 to 50 fathoms deep), and the George's Bank (8 to 17 fathoms deep). The shallow depth of these waters allows the sun light and warmth to reach the sea bottom, which helps the growth of fish.

The abundant quantities of plankton brought down by ocean currents and big rivers provide the necessary food for the fish.

The constant mixing of waters with varying temperatures and salinities, particularly as a result of the confluence of cold and warm ocean currents, is an important factor promoting the growth of fish in these areas. A large number of fishforms die as a result of a change in the temperature of the sea water. These dead fishforms offer the best food for the others who survive.

The indented coastlines provide harbours, bases and refuge in stormy weather for the fishing fleet. The gently sloping, muddy, and sandy bottoms are generally suitable for trawling.

Very often, nearness of forests providing timber for the building and repair of fishing boats contributes to the development of the fishing industry.

These fishing areas generally have a large variety of fish of excellent quality. The main varieties of fish caught are mackerel, cod, herring, haddock, salmon, halibut, hake, pilchard, plaice, sardine, and bonito. Some of these fish move in *schools* or *shoals* and can be caught in great numbers. (Fig. 2.)

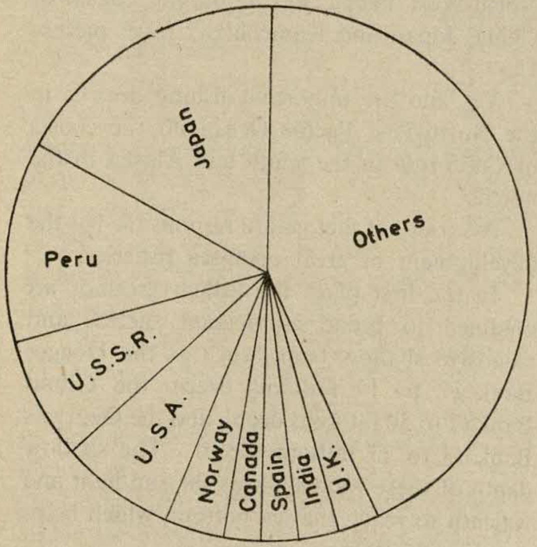


Fig. 2 Fish Catch by Countries (1961)

The total fish catch of Japan in 1961 was 67.1 million metric tons, whereas that of India was 9.6 million metric tons. Why do the Japanese people catch and eat more fish than any other people in the world?

Methods of Fishing—Spears are used in some parts of the tropical and polar lands; but traps, nets and hook and line are the chief methods of catching fish. Pound nets and weirs are other kinds of traps but the bulk is caught by baited hooks and lines in shallow waters.

Fish swimming on the surface are usually caught by *drift nets,* drawn by slow moving boats, or by seines or vertical nets, the strings being drawn together when the fish are inside. Such fishing boats are known as *drifters.* (*See* picture 9.)

Trawls are huge conical bags of net drawn along the bottom of the area to catch fish at the bed of the sea. The boats dragging the trawls are known as *trawlers.*

Modern fishing fleets carry refrigeration plants or floating cannery to clean, wash, prepare, salt, and can the fish ready for distant markets. Aeroplanes and radio signals are used to locate large shoals of fish.

The wealth of the sea is immense but not inexhaustible. The attitude of man towards this important food resource is gradually changing. In several countries, scientists are engaged in studying the life habits of fish. They have undertaken scientific studies of fisheries. Some countries maintain fish hatcheries. There they seasonally stock these fish hatcheries, more commonly known as *fish farms,* with more productive and useful varieties of fish.

In these areas fishing is as serious an occupation of the people as farming is in other areas. Oysters and other shell fish found near the coastal muddy waters are systematically planted in these areas. The wealth of the sea is then harvested at regular and controlled intervals. Such fish farms are common in the Japanese coastal waters. (*See* picture 11.) The other countries where fish farms are developed in the coastal waters are the United States, China and Korea.

Fish is an important source of food, rich in protein. It yields fish oil which is used in lamps and in making soap and margarine. Fish refuse is used as a fertilizer and as a feed for poultry.

In India, fishing is carried on along the sea coasts and in rivers and tanks; but the catch is inadequate to meet the growing demand of the country. The Government of India has initiated some action for the development of her fisheries on modern lines, with the co-operation of countries like Norway and Japan. The use of various types of modern vessels and nets is being encouraged by our Government. (*See* pictures 13 and 14.) Deep sea fishing, off the west coast from Okha to Trivandrum, is becoming more and more significant. Co-operative cold-storage plants have also been introduced at some places. Inland fishing is also being developed in States such as Bengal and Bihar.

Whaling is a type of fishing by itself. Whales are killed for oil and meat. It is practised in the far north and in the far south. Big ships used for whaling are, in fact, floating factories that remain off the shore for several months. Various whale products are processed on these big vessels and are packed for marketing. Whaling constitutes an important part of the Norwegian economy. (*See* picture 12.)

EXERCISES

Review Questions

1. Answer the following questions as precisely as you can:

   (*i*) What major changes did the Industrial Revolution bring about in the life of man with respect to production and growth of learning?

   (*ii*) Why are the regions with subsistence hunting and fishing sparsely populated?

   (*iii*) Why is an Eskimo a far more skilful and ingenious hunter than the one in the equatorial forest?

   (*iv*) How did the methods of fish preservation revolutionize the character of fishing industry?

   (*v*) How does whaling differ from fishing?

   (*vi*) What is a fish farm and in what way is it similar to an agricultural farm?

   (*vii*) Distinguish between subsistence and commercial lumbering.

2. Review in brief the basic occupations of man as landmarks in his development. State carefully how one stage led to the other.

3. Describe the major forest resources of the world bringing out the contrast between tropical and temperate forest, their forest products and lumbering operations.

4. Examine carefully the factors responsible for the location, development and commercial exploitation of open-sea fisheries. Give specific examples whereever possible.

5. Give a technical term for each of the following statements:

   (*i*) Wood derived from broad-leaved deciduous trees.

   (*ii*) A kind of living in which a man produces goods mainly for consumption in his household.

   (*iii*) An extensive plant society of shrubs and trees having the quality of self-perpetuation.

   (*iv*) Wood derived from coniferous trees.

   (*v*) A science and art of farming, cultivating, and managing forests and the growth of timber.

6. Classify the following trees according to the four major forest groups, viz., (*a*) Tropical Rain Forests; (*b*) Monsoon Forests; (*c*) Deciduous Forests; and (*d*) Coniferous Forests:

   (*i*) Teak
   (*ii*) Pine
   (*iii*) Redwood
   (*iv*) Mahogany
   (*v*) Douglas Fir
   (*vi*) Chestnut
   (*vii*) Oak
   (*viii*) Sal
   (*ix*) Ebony
   (*x*) Rosewood

7. Choose the most appropriate ending:

   Major fishing banks are found in temperate and cool climates because

   (*i*) the continental shelves are confined mainly to the temperate zones.

   (*ii*) the proximity of forests enables the building and repairing of fishing craft.

   (*iii*) the areas surrounding the fisheries are densely populated and technologically advanced.

   (*iv*) waters with different temperatures mingle at some places in this part of the world.

   (*v*) a large number of rivers join the sea supplying enough food for the fish.

Finding Out

1. Find out information on the important tribes of India and the occupations

they follow. See if they are engaged in gathering activities. Draw a map of India and write the names of the various tribes in their respective regions.

2. Find out all that you can about the fishing industry in India and the steps being taken to augment fish supplies. Write an essay bringing out clearly the role of fishing in our campaign for self-sufficiency in food.
3. Find out useful information regarding wild life in India. List a few important species of wild life that are likely to be extinct in the near future unless effective steps are taken to preserve them. What steps have been taken by the Government to preserve wild life in our country?

Cartographic Work

1. Draw a world map of forests and identify six leading producers of timber. After collecting data prepare a bar diagram to show their relative position in the production of timber.
2. Draw a map showing areas under different types of forests in India. Paste the pictures of important forest products and industrial goods depending upon raw materials derived from the forests.

Picture Reading

(*i*) In what picture of the forests do you see the undergrowth?

(*ii*) Study carefully the pictures dealing with various fishing operations and write a note pointing out the growing role of the scientific methods being used on a large scale.

Films Available

i. Lacs from Lac. No. 661; 9 mins; Hindi; D.A.V.E.

ii. Green Glory. No. 634.9; 12 mins; Hindi/English; D.A.V.E.

iii. Redwood Saga. No. 674.2; 11 mins; English; D.A.V.E.

iv. Forests and Conservation. No. 634.9; 11 mins; English; D.A.V.E.

v. Caribou Hunters. 18 mins; English; C.H.C.

vi. Hunters of the North Pole. 10 mins; English; C.H.C.

vii. Underwater Spear Fishing. No. 597; 14 mins; English; D.A.V.E.

viii. The Oysterman. 18 mins; English; C.H.C.

ix. Fishery in Japan. S.No. 77; 30 mins; English; J.I.C.

x. Herring Fishing on the High Seas. S.No. 381; 13 mins; English; Embassy of the Federal Republic of Germany.

xi. Harvest from the Sea. No. 639.27; 11 mins; Hindi/English; D.A.V.E.

xii. Whaling. No. 639.28; 8 mins; Silent; D.A.V.E.

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CHAPTER 3

Pastoralism

MAN in his early stage was merely a hunter and a gatherer. He then lived entirely by hunting and gathering. In course of time, however, he succeeded in domesticating certain animals. He found them to be of great use and help to him. The domestication of animals is, indeed, a great achievement of man. It represents an important landmark in the march of human civilization.

With the domestication of animals came a change in man's ways of living. He was confronted with new problems. He had to protect his animals from wild beasts and to provide them with grass and water. He was compelled to move from place to place in search of green pastures and water for his animals. Thus he led a *nomadic life,* and wandered much more than ever before.

Animal grazing and herding are *pastoral occupations* of man as they are solely dependent upon pasturelands; and the type of economy that entirely depends upon animals is called *pastoralism.*

No one knows exactly when and where man learned to tame wild animals. Nor does anybody know how long he took to put them to different uses. However, it is quite clear that domesticated animals provided him with food such as milk and other dairy products, besides meat, eggs, and poultry. They also provided raw materials such as wool, hides and skins to satisfy his needs of clothing and shelter. Moreover, the domestic animals worked for man as beasts of burden. Some of them were used to draw a plough or pull a cart. Man thus supplemented his own muscular power with animal power and valued certain animals, like the dog for companionship.

Many and varied are the animals herded by man in different parts of the world. Animals most commonly herded are cattle and sheep. However, animals such as water-buffaloes, goats, camels, horses, yaks, llamas, alpacas, and reindeer are kept in certain parts. All these animals are *herbivorous,* that is grass eaters. The areas most suitable to them, therefore, are the grasslands of the world (Fig. 3).

Grasslands and Animals

The grasslands occur in the regions of moderate rainfall both in the tropics and in the temperate lands. The grasslands of the world are classified into two major types—the tropical grasslands or the savannas, and the temperate grasslands, that is the steppes and the prairies.

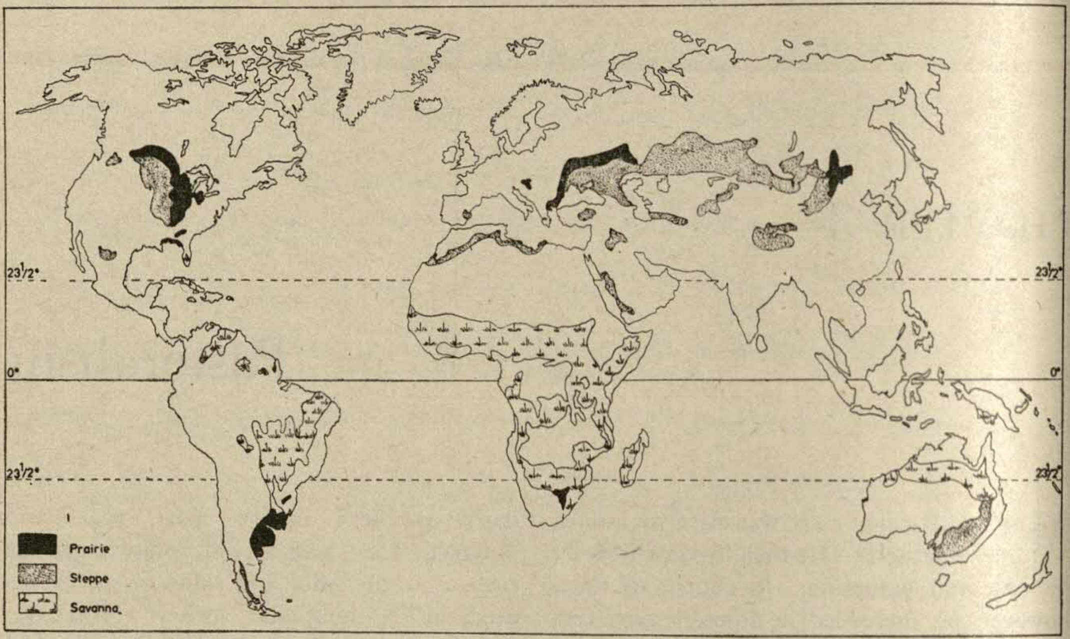

Fig. 3. Grasslands of the World. (Adapted from H.M. Kendall, R.M. Glendinning and C.H. MacFadden.)

Grasses require less water than trees. Grasslands are, therefore, confined to relatively dry areas. The landscape consists of a smooth cover of natural grasses occasionally interrupted with trees, shrubs and bushes. Why are grasslands characterized by a low density of population with extensive use of land?

Savannas—The tropical grasslands of the Americas, Africa and Northern Australia are known as the *savannas.* The rainfall in the savanna region varies from 50 centimetres to about 160 centimetres. The typical landscape of the savannas consists of tall, coarse grasses and scattered trees. The rainfall in the region is not as effective as it appears to be from the climatic statistics, because of long dry spells and rapid evaporation owing to high temperatures.

Although these grasslands support a large number of cattle they do not produce quality beef since the grasses are not very nutritious. Diseases, such as Texas fever, hoof and mouth disease and anthrax, are common. These animal diseases, and insects like *tsetse* flies and *tick*, take a large toll of their life.

Temperate Grasslands—These grasslands are found in the temperate zones of the Americas, Asia, New Zealand, Southern Australia and on the Plateau of South Africa. The precipitation in these grasslands varies from 25 centimetres to 75 centimetres. Although the precipitation is subject to marked fluctuations it is more evenly distributed over the year, with the maximum amount of rainfall in spring and summer when grasses need it most. The rainfall is more effective because of the relatively low temperatures of the region. The grasses are more nutritious and thus are suitable for rearing cattle for beef and dairying.

Temperate grasslands are sub-classified into steppe and prairie types. The word *steppe* stands for short-grass cover where individual plants generally form a contiguous mat some 10 to 20 centimetres high. *Prairie* on the other hand signifies a tall-grass cover equally contiguous but with a height of about 45 to 60 centimetres. Prairies fall in relatively humid areas, whereas the steppes are confined to semi-arid regions.

Suitability of Grasslands—Areas with a fairly good amount of rainfall well distributed throughout the year have good pastures and are suitable for the rearing of cattle. Low rainfall regions with short grasses are suitable for the rearing of sheep. The hot desert regions with a scanty rainfall grow thorny shrubs and are suitable for camels and goats. They can stand excessive heat and drought. The Angora goat of Anatolia is well-known for its long silky wool known as *mohair*. The cold deserts abound in mosses and lichen. They are suitable for yaks and reindeer.

Types of Grazing

Grazing and herding are the most important activities connected with the utilization of grasslands. Grazing like gathering, hunting, and fishing is also of two types—subsistence grazing and commercial grazing. In spite of marked differences in the methods of work and living, both the types of activities represent extensive use of land, the maximum utilization of natural vegetation, and a low density of population.

Each herbivorous animal requires a few hectares of grassland to graze upon. This is called the *carrying capacity* of the land. Large areas are required for grazing animals, whereas the number of people called upon to look after them is very small. This explains the characteristic feature of the grazing lands, *viz.*, a low density of population with extensive grazing areas. Generally these lands can be put to no use other than the grazing of animals.

Nomadism and Subsistence Grazing

Nomads are clans or tribes that move from place to place in search of the means of subsistence. Herdsmen who are constantly on the move in search of pastures for their animals are called *nomadic herdsmen*. They are also called *pastoral nomads*. The essence of their *nomadism* is movement to meet the needs of herds of cattle, or flocks of sheep, or other domesticated animals.

Subsistence grazing or the nomadic way of life is confined generally to the Old World lands of Eurasia and Africa. This way of life and economy persists because of isolation, lack of market, and poor environmental conditions that demand constant, or intermittent movement in search of forage and water, for the livestock.

In the grasslands of the steppes and to a lesser extent in the savannas, herdsmen roam about in extensive grasslands in search of pasture and water for their animals from one part to the other, with the seasons. They generally have no permanent dwellings in any place. They live mostly in tents which can be easily dismantled and carried from place to place. They herd different kinds of animals at the same time and obtain their food, clothing, shelter and other simple needs from them.

The scarcity of food and water and the strict discipline which these tribal herdsmen observe generally make them good fighters.

Seasonal migration is a characteristic feature of subsistence grazing. Climate, through its control over natural vegetation, makes migration necessary. For example, the Kirghiz, the pastoral nomads of Central Asia, live in the great Tien Shan Highlands in summer and descend to the lowlands of the north in winter.

Occasional showers in the arid deserts influence the pace and direction of migration.

In mountainous parts, people with their herds of animals migrate to alpine meadows or valley pastures at higher altitudes in summer and come down to lower levels in winter.

This seasonal movement of livestock from and to the mountains or between the regions of differing climates is called *transhumance*.

Transhumance is practised, for example, in Spain, France, the Swiss Alps, and in the Himalayan regions *viz.*, the valleys of Kangra, Kulu and Alaknanda. (*See* picture 17.) In many cases the herdsmen have their semi-permanent dwellings in both the regions. In summer, they fatten their animals on the alpine pastures. In these high pastures since herdsmen are unable to sell the milk locally, they generally convert it into cheese and cream.

The desert people of South-West Asia and North Africa spend the winter on the fringe of the desert and migrate to the mountains or to the oases in summer.

The Masais of East Central Africa live in low valleys which abound in short grass in the wet season and migrate with their cattle and sheep to the meadows of high plateau in summer.

The people of the tundra also migrate with their herds of reindeer to the north in summer and to the south in winter.

In certain parts, people combine pastoral nomadism with sedentary-agriculture.

Subsistence grazing or pastoralism has been practised in tropical grasslands for hundreds of years. But with the technical know-how of the advanced countries in the temperate grasslands, even the tropical lands hold a fairly good promise of supplying quality beef and dairy products, if scientific methods of breeding, controlled grazing, and raising nutritious grasses are employed and modern transportation facilities are provided.

Commercial Grazing

Unlike the pastoral nomads, the herdsmen engaged in commercial grazing lead a settled life. The animal products which they produce enter national and international trade.

Commercial grazing is practised on a very large scale in the New World lands, *viz.*, the Americas, Australia and New Zealand, where ranches have now become the symbol of this new, large-scale venture, which is run on the most modern and scientific lines. Commercial grazing as an institution has grown only during the last century.

Activities on a Ranch

A settled commercial herdsman has a fixed landholding of his own in which he may graze his animals. It is usually a fenced-in large area and is a big cattle farm. Such a large animal-breeding establishment is known as a *ranch*.

The herdsman has a permanent ranch-house. There are houses for his horsemen too. A ranch possesses a special place called *corral*, where the animals are sorted, branded, and bred. (*See* picture 19.)

When pastures are not sufficient, the herdsman has alternative arrangements to feed his animals. Wells and ponds are also provided on the ranch to ensure a constant supply of water.

There are *vats* where the animals are dipped in disinfectants to control diseases.

The commercial herdsman generally keeps only one or two kinds of animals for specific purposes like production of meat, or dairy products.

The fattening of pigs or lambs or cattle, the slaughtering of animals, and the production of the different dairy or animal products are done in different parts of the ranch. The output of such a big ranch is very large and is usually sent to other areas or countries.

The temperate grasslands with their moist, cool climate are suitable for commercial grazing. These include the interior of North America, south-eastern South America, western Europe, the plateau of South Africa, southern Australia, and New Zealand.

Cattle Rearing

Cattle may be reared for different purposes; for meat or milk, and other dairy products, or for work on the farms. According to the purpose for which they are kept, the cattle are classified into *beef cattle*, *dairy cattle*, and *draught animals*. (*See* picture 21.)

Whenever reference is made to the total number of cattle, all the three types are taken into consideration (Figs. 4, 5 and 6). In commercial grazing we are concerned only with the beef and dairy cattle. Moreover, since dairying is an advanced agricultural industry, it would be dealt with in greater detail in the Chapter on Agriculture.

In North America, although cattle and horses were introduced by the Spanish people in the sixteenth century, the need for commercial grazing was felt only when the areas of eastern North America were highly industrialized and became densely populated as in the case of Europe. People in these areas required quality beef, dairy products, and leather goods in large quantities.

As more and more land in the Great Plains and prairies of the United States and Canada was brought under the plough to produce wheat, maize, cotton, and other crops, the cattlemen had to move more and more to the west. Now the eastern slopes of the Rockies have the big ranches of these two countries, where a very large number of animals graze.

In the United States, animals raised in the western areas are sent to the maize belt for fattening before they are sent to the great modern slaughter-houses at Chicago and other centres. (*See* picture 20.)

In earlier days, live animals were exported

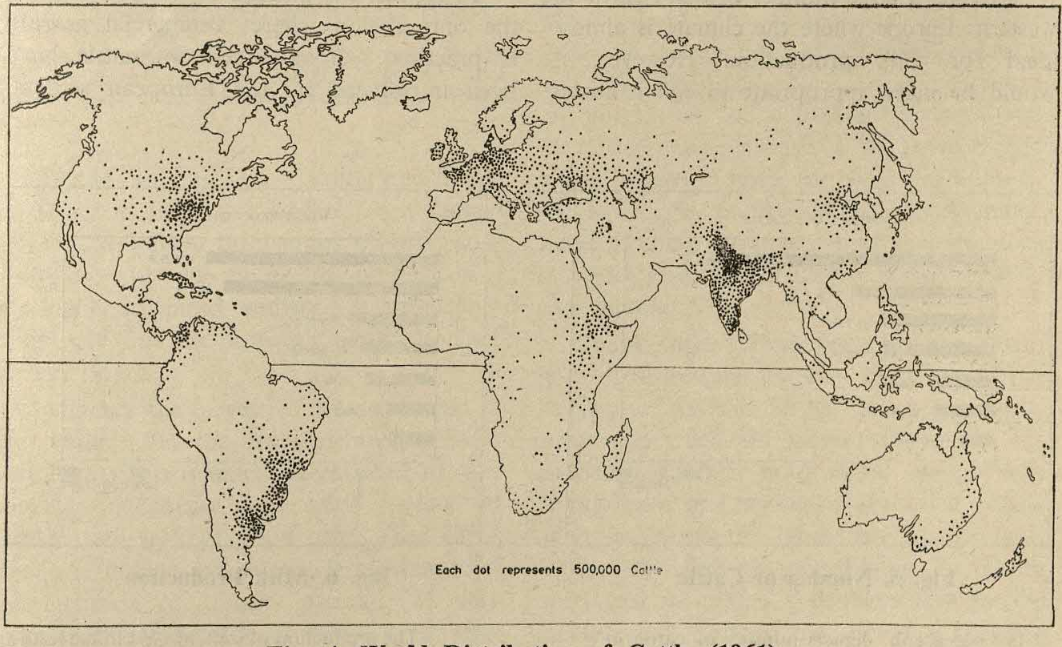

Fig. 4. World Distribution of Cattle (1961)

Cattle are almost absent in extremely hot, cold and wet regions. They are largely confined to semi-arid and semi-humid areas particularly the grasslands and open woodlands of the world. What relationship do you find in agricultural lands and areas suited for commercial cattle grazing?

to Europe and many perished or became too lean on the way. Now, refrigeration and cold storage have made possible the transportation of meat over long distances without getting spoilt. As the value of these animal products per unit of their weight is many times that of plant products, they can easily stand the cost of transportation to distant densely settled areas, whether inland, or overseas.

The temperate grasslands of South America are the leading areas of commercial grazing in the world. The rolling lands of the Pampas, and southern Patagonia and the plains and mountain slopes of Argentina are known for their beef cattle. Suitable soils and climate, nutritious alfalfa grass scientific methods of grazing and animal care, good transport facilities and a low density of population explain the leading position of Argentina among the world exporters of beef (Fig. 7).

There is a large number of dairy cattle in western Europe where the climate is almost ideal for milk production. However, it would be more appropriate to call it mixed and intensive farming than commercial grazing. The practice of keeping cattle, pigs, poultry, and other animals on the farms while raising crops is called *mixed farming*. The large industrialized areas and urban centres offer remunerative markets for the various cattle products.

Countries such as the Netherlands, Denmark, France, and Switzerland have specialized in dairy products on modern lines and large amounts of cheese, butter and powdered and condensed milk are exported. These European countries use all available land either for farming or for grazing. Some of the best breeds of cattle like the Holstein or Aberdeen belong to west Europe. (*See* picture 21.)

Cattle-rearing is an important aspect of the Soviet economy. A large number of cattle is concentrated in the Ukraine and in the eastern regions (Figs. 4, 5 and 6).

In Africa, the plateau of South Africa is the only region where commercial grazing is practised. Good breeds of cattle have been introduced by the European settlers.

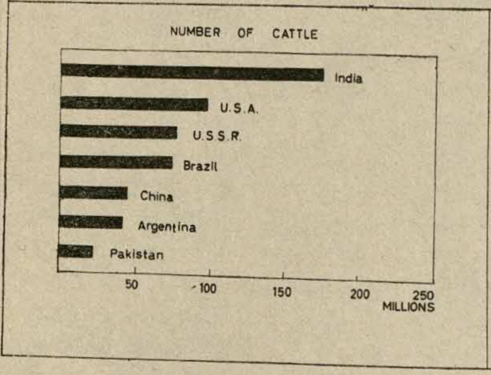

Fig. 5. Number of Cattle

The bar graph depicts number of cattle in 1960-61 in some leading countries. India leads the world in number of cattle but ranks fairly low in milk production. How would you explain this?

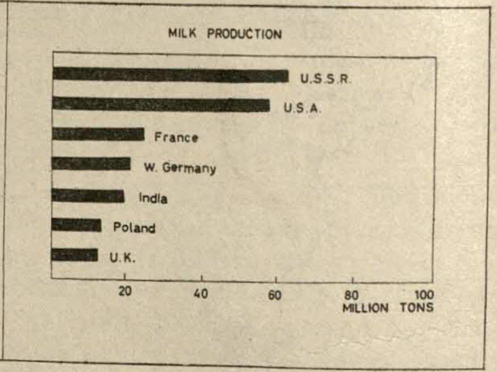

Fig. 6. Milk Production

The production of milk in 1961 in the leading milk producing countries is shown above. The Soviet Union and the United States are the leading producers of milk. Compare their position in regard to the number of cattle and milk production.

The elevation of the plateau from 1000 to 2000 metres is the main difficulty in transporting animal products.

Cattle are reared in more humid parts of the temperate grasslands in Australia, especially in New South Wales, Victoria and Tasmania.

As compared to Australia and Argentina, New Zealand is in a more favoured position so far as cattle rearing is concerned. It does not face disastrous droughts since rainfall is fairly good and equable. Butter and frozen meats are its important exports even though it is far away from the centres of their consumption. In spite of its low population it is a highly advanced country. Its prosperity is entirely due to pastoral industries. (*See* picture 18.)

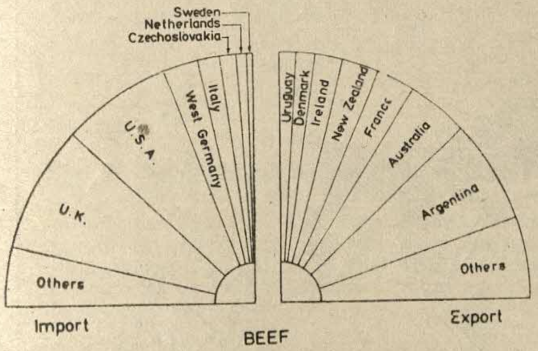

Fig. 7. Beef Exports and Imports (1961)

The chief exporters of beef are not generally the chief producers, for example, the United States. What factors do you think are more important for exports of beef?

India has the largest number of cattle in the world. Yet the total yield of milk is very low. This is mainly because of the hot climate, inadequate and poor quality of fodder, and lack of good care. The cattle wealth of India appears to be large because of the inclusion of draught animals. A very large number of cattle is used for drawing carts and ploughing fields.

Among animals maintained for dairy purposes in India, the buffalo is very important. It is better adapted to the hot, humid conditions under which it yields more and thicker milk. In India, greater emphasis is on the fat content of milk than on its volume. The buffalo yields thicker milk from which more *ghee* can be derived.

Sheep-Rearing

Sheep, like cattle, are multipurpose animals raised for mutton and wool. They are reared throughout the middle latitudes where they withstand cold winters. In dry climates they graze in pastures which are too meagre for larger animals like cattle. They do well even in the high altitudes of the tropics.

Sheep are raised in great numbers in Australia, the Soviet Union, China, Argentina, New Zealand, India, South Africa, Turkey and the United States (Fig. 8).

In 1961, Australia had as many as 152 million sheep, about 14 times its total human population. The two important regions in which sheep are reared are South-East Australia including the Murray Darling basin, and South-West Australia. Sheep for mutton are reared on the cultivated pastures and nutritious natural forage in the more humid areas, whereas sheep for wool are kept in the more arid, or dry parts of the country. Recently some new breeds have been developed which give both quality mutton and wool. (*See* picture 22.)

The Australian herdsman's major problem is to provide water for his sheep and cattle. In the great Artesian Basin, the artesian wells ensure an adequate water supply for his animals. Rabbits, wild dogs, cattle tick, prickly pear and droughts are some of the other problems the herdsman has to face. Moreover, shearing of millions of sheep every year in itself is a problem that can be tackled only through the use of a shearing machine. (*See* picture 23.)

The Australian Government has done much to solve these difficulties. The Government provides virus which kills rabbits but does not harm other animals. Bounties are sanctioned for killing Dingo—wild dogs—which are a menace to sheep and cattle. Dipping tanks are constructed to control cattle tick. Prickly pear, a kind of cactus, spreads over large areas making them useless for grazing. An insect which feeds on cactus and kills it has been introduced to reclaim such areas.

To overcome the paucity of drinking water, especially on long trails, wells and tanks have been provided. Windmills and feeding stations are also established along such trails. Breeding is regulated to ensure quality sheep and cattle.

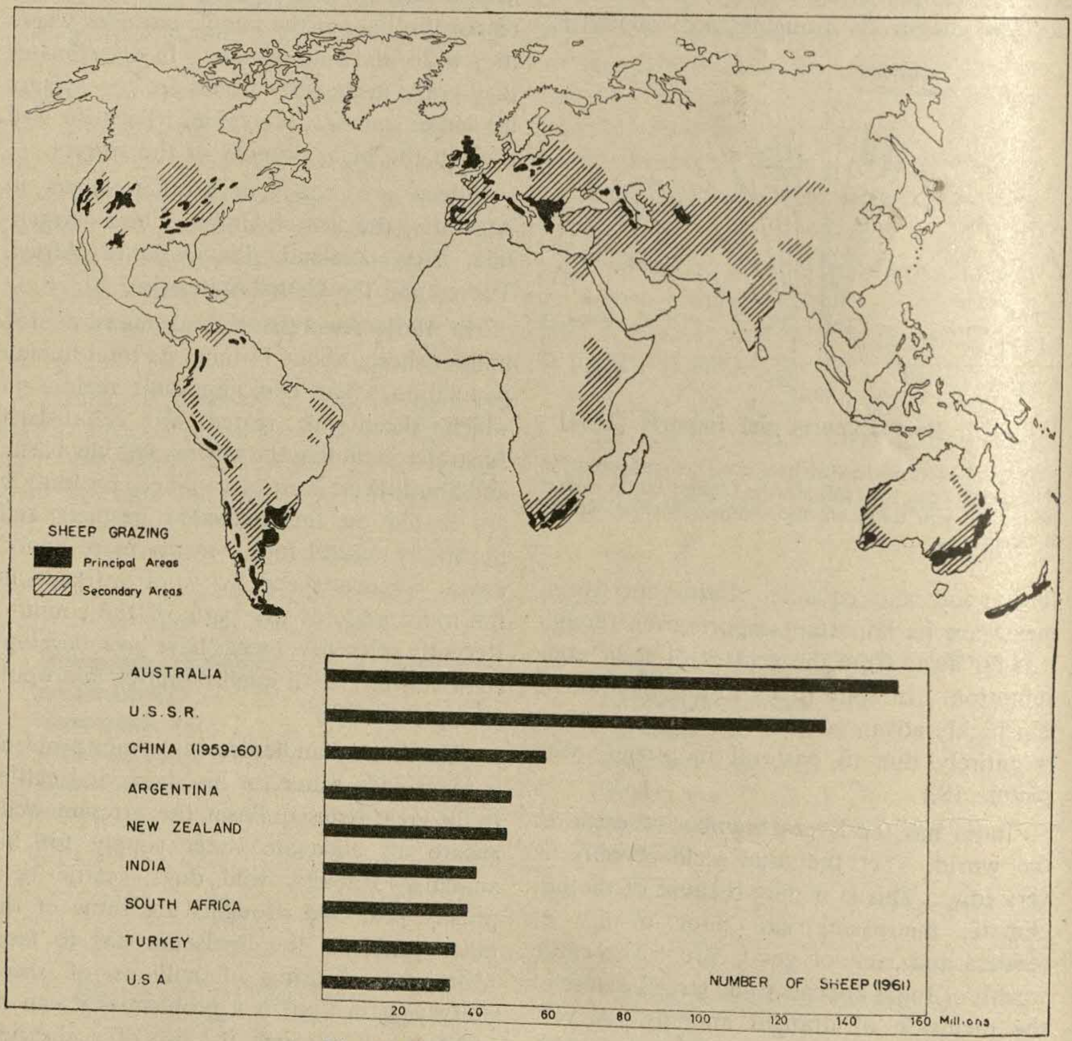

Fig. 8. World Distribution of Sheep

Note the widespread distribution of sheep. Most of the sheep-rearing areas are in mid-latitudes and in sub-tropics, including the steppe and humid areas. What makes Australia the leading country for sheep-rearing in the world?

The chief export of Australia is wool. (*See* picture 24.) For this, millions of quality sheep are raised. The fine breeds like the *merino* have been introduced from Spain. (*See* picture 22.) Australia stands first both in the production and export of wool (Fig. 9).

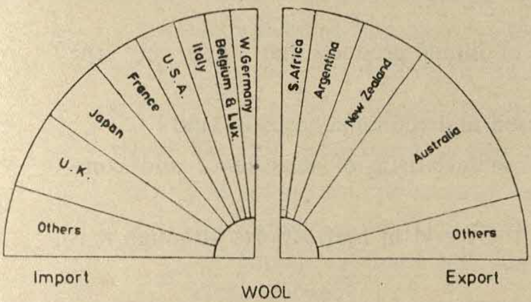

Fig. 9. Wool—Imports and Exports (1961)

Note that Australia and New Zealand together account for more than half the wool that enters world trade. Do you think that wool is generally produced far away from the centres of its consumption?

New Zealand also raises sheep for mutton and wool. In fact, as compared to Australia, it is more favoured for rearing quality sheep for mutton such as the Canterbury Lamb. However, sheep for wool are equally important in this country. They dominate the eastern parts of the islands. Wool is the leading item of export in terms of value.

In South America, southern Patagonia, southern Chile, Tierra del Fuego, and the Falkland Islands are exceptionally suited to sheep-grazing. The uniform low temperatures help in the growth of fine and heavy fleece.

South Africa is yet another country of the Southern Hemisphere that has an important share in the export trade of wool. Wool and sheepskins are exported to Europe.

In the Soviet Union, the chief sheep-breeding zones are central Asia and Kazakhastan, the north Caucasus, the Crimea, and the Volga regions. They are also found to a less extent in Trans-Caucasus, Siberia and the Urals.

North-west China has a fairly large concentration of sheep.

Turkey has also a fairly good number of sheep and goats.

In the United States, the sheep are most concentrated in Texas. About two-thirds of the sheep in this country are in its western half.

Sheep are reared in our country in the Western Himalayan region and also in the drier parts of the Deccan plateau. Sheep raised in the cooler areas, that is, in the valleys or slopes of the Himalaya in Jammu and Kashmir, Punjab, Himachal Pradesh, and Uttar Pradesh, yield fine wool. Sheep raised in Rajasthan and in parts of the Deccan plateau yield coarse wool. Exports of animal products from India consist mainly of skins, hides, and coarse wool.

Goats of Kashmir yield long soft wool. Their wool is used for making shawls and blankets.

Commercial grazing has no doubt made impressive progress during the last century as a result of advances in science and transport facilities. However, it may be remembered that overgrazing, droughts, and especially the encroachment of farming or agriculture on grazing-grounds are the main problems which this industry has to face squarely to maintain its position.

EXERCISES

Review Questions

1. Answer the following questions:
    - (*i*) How did the domestication of animals bring about a change in the life of early man?
    - (*ii*) Name the four important types of animal products that enter into the world trade.
    - (*iii*) What are the essentials of a good and economic grazing land?
    - (*iv*) Which is the most important characteristic of subsistence and commercial grazing lands?
    - (*v*) Why is Argentina able to lead the world in beef exports although it is only the third largest producer?
    - (*vi*) What is meant by the carrying capacity of land?
    - (*vii*) Why are rabbits considered a menace to sheep rearing in Australia?
2. Compare and contrast important grasslands of the world under the headings of location, climate, types of grasses, and grazing practices.
3. Give a systematic account of the sheep rearing industry in Australia, bringing out the problems which the herdsman has to face and the means adopted by him and his government to solve them.
4. Make out correct pairs from the two columns:

(A)
- (*i*) Clans or tribes that move from place to place in search of subsistence.
- (*ii*) A person belonging to a large animal breeding establishment.
- (*iii*) Herdsmen who are constantly on the move in search of pastures
- (*iv*) A person dealing with animal products.
- (*v*) A person growing a number of crops in his fields.
- (*vi*) A person who keeps cattle, pigs and poultry in addition to the raising of crops on the farm.

- (*i*) Nomads
- (*ii*) Pastoral nomads
- (*iii*) One engaged in mixed farming
- (*iv*) Rancher

(B)
- (*i*) Prairie
- (*ii*) Savanna
- (*iii*) Steppe

- (*i*) Tall coarse grasses with isolated trees.
- (*ii*) Pastures at a high altitude in the mountains.
- (*iii*) Forests open to cattle for grazing.
- (*iv*) A relatively tall-grass cover forming a contiguous mat about half a metre high.
- (*v*) A short-grass cover forming a contiguous mat about 10 to 20 centimetres high.

5. Listed below are the natural habitats of the domesticated animals, namely, the yaks, sheep, goats, reindeer, buffaloes, beef cattle, dairy cattle, elephants, and camels. Name the appropriate animal against each of the following:

   (*i*) The hot-wet or humid tropical lands.
   (*ii*) The semi-arid lands with meagre pastures.
   (*iii*) Tropical evergreen and semi-deciduous forest lands.
   (*iv*) High plateaus with mosses and lichens.
   (*v*) The arid lands with thorny shrubs.
   (*vi*) The semi-arid pastures of mid-latitudes.
   (*vii*) The cold deserts with mosses and lichens.
   (*viii*) The semi-humid pastures of mid-latitudes.
   (*ix*) The varied habitats ranging from cold winter with low rainfall, through dry climates with meagre pastures in the subtropics to high altitudes in the tropics.

6. Complete the following statement by choosing a correct ending:
   India should develop its cattle wealth and augment the supply of animal products by

   (a) developing a large number of big ranches run on most scientific lines, as in the Western United States.
   (b) Copying the example of intensive mixed farming practised in the temperate lands of western Europe.
   (c) Emulating the example of a tropical country like Australia, where the climatic conditions are more similar to those of ours.

   Give reason in support of your choice.

Finding Out

Find out all that you can about the cattle wealth of India and the steps being taken by the Government to improve these animal resources. Write an analytical essay indicating the lines on which these resources need to be developed.

Cartographic Work

Prepare suitable graphs, charts, cartograms and distribution maps on topics such as suggested below:

(*i*) Cattle and sheep map of India.
(*ii*) Total milk production, yield per head of milch cattle and *per capita* consumption of milk.
(*iii*) Our position in the world with regard to the items mentioned in (*ii*) above.
(*iv*) Wool production in India, and our imports and exports of wool.

(*v*) Our position in the world trade for hides and skins.

(N.B. Consult United Nations and FAO Year Books for world statistics. Plan the work as a class project. See also the relevant appendices.)

Picture Reading

Compare the picture, 'Sheep Grazing in Australia' with that of 'Cattle Grazing in New Zealand'. What information do you get from the pictures regarding the climate and the nature of the pasturelands? In what respects do the Swiss grazing lands differ from these two?

Films Available

i. Animals in Modern Life. No. 636; 11 mins; English; D.A.V.E.
ii. Wool—from Sheep to Clothing. No. 677.3; 11 mins; English; D.A.V.E.
iii. American Cowboy. 30 mins; English; U.S.I.S.
iv. Our Cattle Wealth. No. 636.2; 11 mins; Hindi/English; D.A.V.E.
v. A Million Pounds a Day. No. 2493; 21 mins; English; B.I.S.
vi. The Shearer. No. 39; 10 mins; English; A.H.C.
xii. The Jackeroo. No. 149; 16 mins; English; A.H.C.
viii. The Challenge of Water. No. 165; 25 mins; English; A.H.C.

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CHAPTER 4

Agriculture —Cereals

Agriculture is the practice, art and science of tilling or cultivating the soil and raising crops and animal stock. It is also called *farming*. When man was a hunter or gatherer or herdsman, he was essentially a wanderer or nomad. But the practice of agriculture brought about a marked revolution in his life. With food supply assured from his piece of land, man now began to lead a settled life, the first requisite of civilization. Moreover, agriculture demanded greater co-operation and a higher degree of organization than was necessary for hunting and gathering.

Cereals, which are perhaps the most important staple food of man, are entirely a product of agriculture. Most of our food comes from agriculture. Agriculture also provides raw materials for many of our industries.

Although we are living in the industrial age, agriculture is the backbone of economy in most countries of the world. It is still the chief occupation of man. More than half the labour force of the world today is directly engaged in agriculture.

Many patterns of agriculture have been developed in the world as a result of either varying geographical conditions, or historical background.

Shifting and Settled Agriculture

Some people in the tropical forests, where the density of population is not high, clear patches of ground by burning bushes and trees. They raise crops of yam, banana, cucumber, cassava, and many other roots and vegetables. They also grow rice, millets, maize and sugar-cane in suitable areas.

Manifold are the difficulties in the areas of shifting agriculture. The heavily leached soil soon becomes unproductive. Weeds and unwanted vegetation rapidly encroach upon the cleared ground. Insects, rats, elephants, monkeys, and birds, all try to ruin the crops. Often there are diseases like malaria and sleeping sickness, which spread very quickly.

The people, therefore, keep on shifting from one part of the forest to another where they clear new patches of ground. This is known as *shifting agriculture*. In *shifting agriculture*, a patch of ground is cleared, very often through fire, and cultivated for a short period (few years), until the land is overrun by weeds, or exhausted by leaching. After a gap of several years, the original patch of land is cultivated again. In other words, the land is cropped discontinuously.

The form of agriculture opposed to shifting cultivation is known as settled agriculture. Any form of agriculture, primitive or modern, practised permanently on the same farm or field, whether big or small, is *settled agriculture.*

Subsistence Agriculture

Subsistence agriculture is one in which the farming areas consume all, or nearly so, of the products locally grown. As opposed to subsistence agriculture, areas engaged in *commercial agriculture* produce articles or products that are sold and consumed off the farm. It also indicates specialization in the cultivation of agricultural products to be exchanged with others to meet the various needs of the producers.

Subsistence agriculture may be of various types. It may be shifting agriculture or even settled agriculture. It may be primitive or non-primitive in character. It may be both intensive and extensive type of agriculture. As long as its major purpose, that of fulfilling most of the needs of its local producers, remains unchanged, it remains a subsistence type.

The real distinction between primitive and non-primitive sedentary type of subsistence agriculture depends upon the type of the tools or implements used. The tools of the primitive agriculturists are more or less the same as those used in the shifting type of agriculture. The primitive type of settled agriculture occurs in areas of relatively dense population, where climate and soil are more conducive to a permanent use of the same fields. This is how it differs from shifting agriculture.

In non-primitive subsistence type of agriculture, land use practices and farm equipment are relatively simple. There are ploughs, harrows, permanent hedges and bundings. Moreover, draught animals and poultry are also kept on the farm.

The rice fields of Asia fall into the category of subsistence agriculture, but by no means can they be described as an example of primitive type of agriculture. In fact, they are an example of intensive subsistence type of agriculture. The teeming millions of the densely populated areas in the Monsoon lands (of South and South-East Asia) have to be fed, and hence as much produce as possible has to be extracted from the land.

Rotation of crops and sowing different cereals in alternate rows in the same field is practised as it helps to maintain the fertility of the soil. Wherever possible, irrigation is usually provided. All types of manures like household waste, animal droppings, green manure, night-soil, and chemical fertilizers are also used.

Manual labour is most important and is often supplemented by animal labour for ploughing or threshing. A variety of simple tools and implements are used for different purposes. Small holdings and the uneven nature of the ground make the use of machinery costly and impracticable.

Cattle are kept for household dairy products and as draught animals, but generally not for beef as such. Goats, pigs, chicken, and ducks are kept as they thrive almost exclusively on waste material or poor forage and some of them act as scavengers. They supply eggs, meat, milk, and hides.

Agricultural produce is locally consumed or exchanged for other necessities of life. Only in a few cases is there an exportable surplus. The standard of living is, in general, low, and the bulk of the population is ill-fed and under-nourished.

Commercial Agriculture

Commercial agriculture may also be of different types. It may be extensive as well as intensive. It can be diversified, or mixed farming, or a highly specialized single-crop plantation agriculture.

In *extensive commercial agriculture,* a farmer's main concern is to produce for sale the greatest quantity of crop or food per unit of manpower. This type of agriculture is practised in sparsely populated areas where abundant land is available but the labour is in short supply. The paucity of labour is overcome by the extensive use of machines. This may lead to somewhat careless methods of farming, resulting in low yields per acre as compared to lands under intensive cultivation. The emphasis is on yield per man employed and not on yield per unit area cultivated.

Wide areas under commercial grain farming in the interior of the Soviet Union, the United States, Canada, and parts of Argentina and Australia are examples of this type of farming. Soils of these lands are generally fertile. No irrigation facilities are required as the rain is fairly assured and equable. However, huge capital has to be invested in machinery, as labour is very dear and scarce.

In *intensive commercial agriculture*, a farmer attempts to have the greatest possible output for sale from a small plot of land. It is practised in areas where the pressure of population on land is very great, land is hilly and fields are small, and there is a demand for special types of crops like fruits and vegetables. A large amount of human labour is used to get quality products. The nature of the terrain, the small size of the holdings, and the abundance of labour restrict the possibility of using machines on the farms.

This type of agriculture is practised in the Mediterranean lands. The main produce of commercial importance is fruits. Olives, dates, figs, grapes, oranges and lemons, and other kinds of citrus fruits are produced on a commercial scale. These are exported as fresh, canned, or dried fruits, or in the form of jams, extracts, powders and wines. Manual labour has to be used as the land consists of a complex of plains, valleys, and mountain slopes. Moreover, machines can be used neither in the planting of trees, vines, or vegetables, nor in the harvesting of their produce. Co-operatives are generally found useful in collecting, processing, and marketing the farm produce.

Commercial mixed farming is another intensive type of farming, also known as diversified farming. It is mixed in the sense that animals are also kept on the farm while raising crops. There is no special emphasis on any one crop, but a number of crops are raised. Cattle-rearing either for meat or for milk and other dairy products, is an important aspect of agriculture.

This type of agriculture is followed in areas where the density of population is very high mainly owing to industrial development of a high order. North-West Europe is one such area where this type of agriculture is based on the raising of root crops, cereals and hay, and also rearing of animals for meat and dairy. The yield per acre of land is generally very high.

This method of farming exhausts the soil less as different crops remove different proportions of plant nutrients. A well-developed system of crop rotation also helps in restoring fertility to the land. Soil-building crops, like legumes, are also equally helpful. Animals on the farms consume grains and fodder, but their manure goes back to the soil to enrich it.

Efficient methods of cultivation, quick means of transport such as motor trucks and availability of huge markets in the vicinity, ensure good returns.

As opposed to diversified or subsistence agriculture, *plantation agriculture* is essentially single-crop farming, on a scale that resembles factory production.

Several parts of tropical and a few parts of sub-tropical lands are adapted to large-scale, intensive cultivation of products which have an export market. This is essentially commercial in nature.

There are plantations of rubber, tea, cocoa, coffee, banana, sugar-cane, coconut, spices, pineapple and the like.

Very large estates, huge capital investment, efficient and scientific methods of cultivation, special types of implements, skilled but relatively cheap local or imported labour, an elaborate system of transport, and a complex mechanism of international trade are the characteristics of plantation farming.

Plantation farming was introduced by the Europeans in several tropical countries like Malaysia, Indonesia, India, Ceylon, East and West Africa, and the West Indies. Since World War II, the plantations have largely come under local managements and ownership as these countries became independent one after the other.

Agricultural Produce

A large variety of agricultural products are derived from land. They may be cereals like rice, wheat and millet—the staple food of the millions. They may be pulses like grams and beans which supply us with the proteins. Then there are oil seeds like linseed and mustard. Beverages like tea and coffee are produced from the land. Roots, vegetables, and fruits which form an important part of the diet, are the products of agriculture. Even fibres like cotton and jute are raised from the land.

In this chapter the discussion is restricted to cereals and oil-seeds.

Rice

Rice is the staple food of at least half the people of the world. Almost 90 per cent of the total world output of rice is produced in Asia. Lands producing rice sustain perhaps the highest densities of population as the yield of rice per unit of land is higher than any other cereal. On an average, 16.7 metric quintals of rice is produced per hectare of land.

Rice is essentially a crop of the hot wet lands of the tropics. A uniform temperature of about 25°C, during the growing season is a necessary condition for rice cultivation. Furthermore, an assured rainfall of 100 to 200 centimetres is essential for its growth. Where the rainfall is less than 100 centimetres, it has to be supplemented by irrigation (Fig. 10).

Rice plants grow well in standing water. Therefore, the fields have to be level with bunds on all sides to hold the water. Rice requires an alluvial top soil with a clayey sub-soil. The clayey impermeable sub-soil helps water to stand in the level fields for a considerable time.

In countries like Japan, Indonesia, Ceylon and India, mountain slopes are terraced to obtain narrow, long level strips of ground with bunds made of stone and clay on the lower side. These fields resting one over the other like a staircase are known as *terraced fields*. An unbroken chain of 500 to 1,000 terraced fields, one overlooking the other, along a hill slope is not uncommon. (*See* picture 25.)

In contrast with this panorama of terraced fields, stretch the rice fields of a delta region where they occupy almost every inch of the level alluvial land. But for their monotonous landscape, these rice fields are ideal because of the soil fertility and regulated irrigation facilities.

Rice culture demands cheap, plentiful, and co-operative labour as almost all the work in the fields is done by hand. Harvesting, threshing and storing, all need considerable labour. Normally the entire family of a farmer works in the field, which obviously is more profitable than employing hired labour. Very often the whole village co-operates in a farming operation. In some areas,animals, particularly the water-buffaloes, are also employed for ploughing the flooded fields after the first rains.

There are two major varieties of rice—the upland and lowland. The *upland rice* is grown in hilly and mountainous regions, while the *lowland rice* belongs to the lowlying watery swamps.

There are two methods of cultivating rice—broadcast sowing and transplanting. *Broadcast sowing* is the simple method of scattering paddy seeds in the field. Usually the inferior varieties of rice are sown in this way and their yield is invariably low.

Transplantation, laborious as it is, is the general practice as it gives better yields. Rice is first sown in small nursery plots; and after about three weeks when the plants are about 15 centimetres high, they are taken out carefully by hand in small bunches and transplanted at regular intervals in well-prepared fields.

Rice fields are kept flooded with fresh water as often as possible while the plants are growing. Rice has a husk and an inner covering of bran which protects it and keeps it from getting spoilt in humid climates. The fields are finally drained off and allowed to dry at the time of ripening.

In tropical countries, three or at least two crops a year can easily be grown under favourable conditions. In areas of rather low rainfall, rice is a *kharif* or summer crop followed by some other cereal as the *rabi* or winter crop.

The *Japanese method* of growing rice consists of planting only three or four seedlings in a bunch at an interval of about 25 centimetres, careful manuring, weeding, and controlled water supply. The labour and expense involved are amply rewarded by a rich harvest. Among the major rice-producing countries, Japan has the highest yield per acre. This method is being adopted in India in favourable areas. (*See* picture 26.)

Principal Rice-producing Countries

China is the largest producer of rice in the world although India leads in total acreage under rice. In 1960, it produced 85 million metric tons when India, the second largest producer, accounted for only 51.2 million metric tons. The valleys of Si Kiang in South China and Yangtze Kiang in Central China are known for rice production and 'rice culture' in contrast to the 'wheat culture' of North China (Figs. 10 and 11.)

India stands second only to China in rice production. The fertile valleys and deltas of the Ganga, Brahmaputra, Mahanadi, Godavari, Krishna, Pennar and Cauvery are among the leading rice producing areas in India. Similarly, the coastal strips on the east and west coast are known for their notable rice production. Rice is also produced in certain interior parts, either as a result of assured rainfall of at least 100 centimetres, or owing to the availability of irrigation water. Certain parts of Madhya Pradesh, the Valley of Kashmir, and the Punjab and Kumaon Hills are the examples.

Over large areas, only one crop of rice is raised every year. In certain highly favourable areas two or even three crops a year are grown on the same land, for example, the deltas of the Cauvery and Krishna.

Rice-growing seasons vary from part to part, depending upon rainfall and other climatic conditions. Rice crops in India are divided into three categories, depending upon the season in which they are harvested. They are: *aus*, *aman*, and *boro*.

Aus is an autumn rice that is sown in May-June and harvested in September-October. It is grown in the uplands. Special short-duration varieties have been developed to suit the climatic conditions.

Aman is the most important crop sown in June-July and harvested in November-Decem-

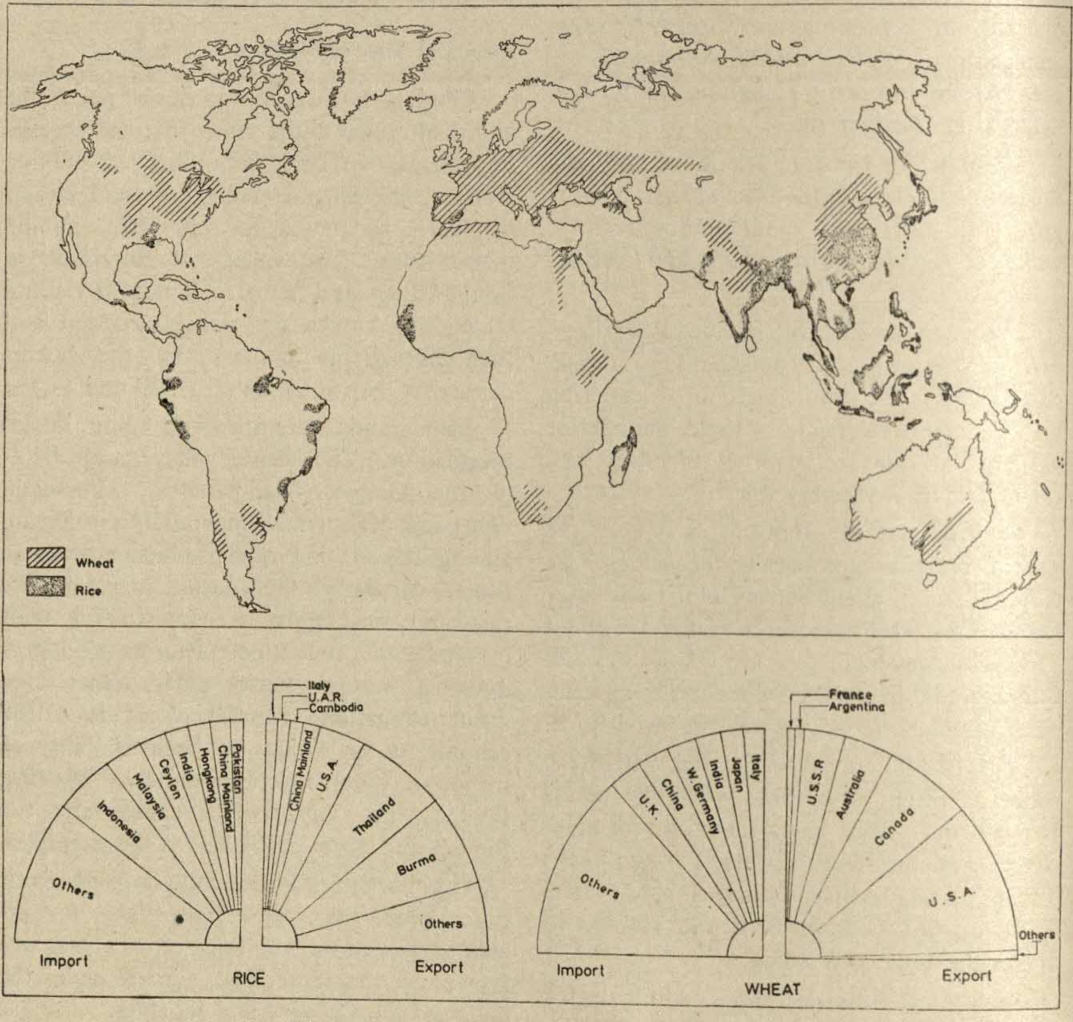


Fig. 10. Rice and Wheat-producing Areas

Cultivation of rice is confined mainly to the gently sloping river valleys, deltas and coastal plains of tropical and humid sub-tropical regions where the soil is heavy, temperature high, moisture plentiful, and labour cheap and abundant. Wheat, chiefly a crop of the temperate zone, is confined to areas between 30°N. and 55°N.; and between 30°S. and 40°S. Compare and contrast the trends in wheat and rice trade (1961).

ber. It is mostly grown in the lowlands. It is a winter crop whose growing-season coincides with the South-West Monsoon.

Boro, a spring crop, is sown in December-January and harvested in March-April. Short-duration varieties are used.

Pakistan follows India in rice production although its total output is approximately only one-third that of India. East Pakistan accounts for the bulk of Pakistan's rice production, and it has a distinct rice culture as against the wheat culture of West Pakistan. A little rice is, however, produced in Sind—the lower Indus Valley in West Pakistan with irrigational water.

Japan produces nearly as much rice as

Pakistan does. Southern Japan with its warm summer monsoon rains is the major rice-producing area. It follows intensive and scientific methods of rice cultivation, and among the major rice-producing countries claims the highest yield per acre. Its yield per acre is about three times that of India. (*See* Appendix VI.)

Indonesia is another large producer of rice. It is also a densely populated country with rice as its staple food. The island of Java accounts for the bulk of its produce, where farms are found both on the level plains and along the valley slopes.

Thailand is an important rice-producing country, and is able to export its surplus produce. Central Siam is the 'rice bowl' of South-East Asia and is faced with the twin problems of drainage and shortage of labour.

Burma is yet another rice-producing country exporting slightly more rice than Thailand. The valleys and deltas of the Irrawaddy and Sittang are the major rice-producing regions.

Brazil in South America produces rice in the Amazon basin where conditions are favourable for rice production. It is possible that it may grow more rice in course of time to meet the rising demands of its fast growing population.

North Vietnam, South Vietnam, the Philippines, Korea, Ceylon, Italy, the United Arab Republic, and the United States are some of the other countries that produce rice. Some of them are able to export part of their produce.

It is interesting to note that all the major producers of rice are deficient in meeting their own requirements. They have to supplement their produce through imports from small and thinly populated countries like Burma, Thailand, and Cambodia. The other countries that export rice are the United States, the United Arab Republic, and Italy, countries which consume very little rice.

Wheat

Wheat is the staple food of the people in mid-latitudes and dry sub-tropical regions. It is a very good bread-making grain. Nearly half the world's population depends on wheat as its main item of food. Like rice, it has been in use for thousands of years. Perhaps, originally it was produced mainly in Anatolia and in the eastern Mediterranean lands. Now its culture has been pushed polewards to the limits of all the temperate lands, and even to the tropical parts of countries like India and Pakistan (Fig. 10).

The climatic requirements of wheat are

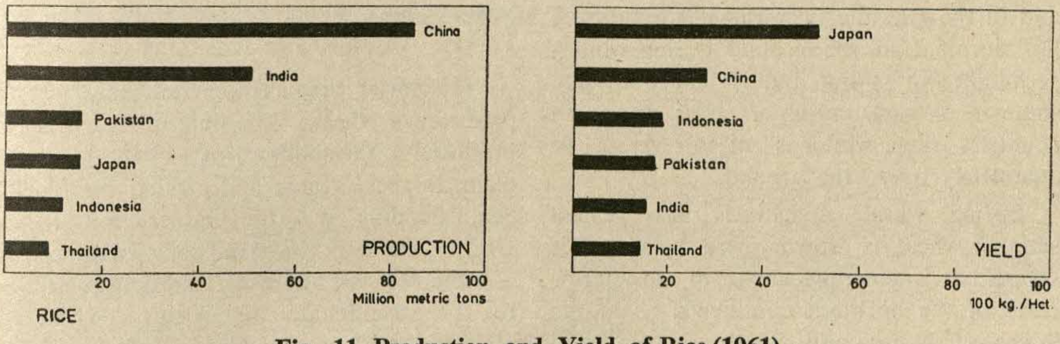


Fig. 11. Production and Yield of Rice (1961)

Generally, the high yield of rice is found not in countries that produce rice on a large scale but rather on a small, intensive scale. Compare the rice yield in India with that of China and Japan.

rather peculiar. It requires a temperature of about 15°C, and needs a rainfall of about 50 to 75 centimetres. At the time of germination and early growth, it requires a cool, moist climate. When the ears of corn are formed, it needs warm and bright weather to ripen them. The grain has to swell before ripening, so a little mositure is necessary then. A bright sunny weather at harvest time is very helpful. Moreover, there should be no frost at least for a period of 90 days for growing wheat.

The black soils or chernozems of the *steppes* of Eurasia and the *prairies* of America are rich in nitrogenous matter and produce wheat of an excellent quality. Loamy soil is generally good for wheat. Unlike rice, water must not accumulate near the roots of the crop; and so a well-drained land, such as rolling or undulating plains, is suitable.

Wheat exhausts the salts or fertility of the soil. Therefore, in countries where intensive methods of wheat farming are employed, manuring and rotation of crops have to be adopted.

The undulating topography of wheat lands is ideally suited for the use of mechanized methods of ploughing, sowing, and reaping.

There are two varieties of wheat—winter wheat and spring wheat.

Winter wheat as in North-West Europe and in the Ukraine is sown in late autumn, lies dormant in the ground during winter, germinates in spring and is reaped in late summer or early autumn. It is grown in countries where winter is not so severe as to completely freeze the ground.

Spring wheat, sometimes also called summer wheat, is grown where the winter is severe. It is generally grown in the interior parts of the northern continents, as in the States of North and South Dakota and Minnesota of the United States, in Canadian prairies and in the interior of the Soviet Union.

In India and Pakistan, wheat is a winter or *rabi* crop because it cannot stand the high temperature in summer. It is sown after the rains in autumn. It grows during the cool winter and it is harvested in the early summer, before it is too hot. Wheat is a winter crop in the Mediterranean type of regions, where it grows during the mild rainy winters.

Wheat is classified also as hard and soft. The wheat of the Monsoon and Mediterranean lands is generally hard, whereas that of North-West Europe is soft. Spring wheat lands generally grow hard wheat. Hard wheat is grown in all those parts where the rainfall is exclusively confined to the early period of growth and the ripening season is free from any moisture.

The hard wheat is specially used for the preparation of such products as macaroni, spaghetti and vermicelli, so popular in Italy. For baking bread, the soft wheat has to be blended with the hard wheat and this explains why the Indian wheat is held in premium in parts of North-West Europe. Hard wheat contains less starch and more protein as compared to soft wheat.

Principal Wheat-producing Countries

The major wheat-producing countries of the world include the Soviet Union, the United States, China, India, France, Italy, Canada, Turkey, Australia and Argentina (Fig. 10).

The Soviet Union is generally the largest producer of wheat. The bulk of its wheat is produced in the southern part of the Russian plain, in the Ukraine and around the Black Sea, extending up to the southern end of the Urals. The dark grassland soil—chernozems—is the best soil for wheat and is responsible for the exceptionally high yields. Wheat is also produced in the Asian steppes of the Soviet Union, where the yield is low, a result of the methods of extensive farming depending upon the use of machines. (*See* picture 27.)

The United States is the second largest producer of wheat, sometimes occupying the first position. The black prairies offer the ideal soil for wheat. There are widespread wheat-producing areas in the United States; however, the greatest production is in the region between the Mississippi and Lake Erie.

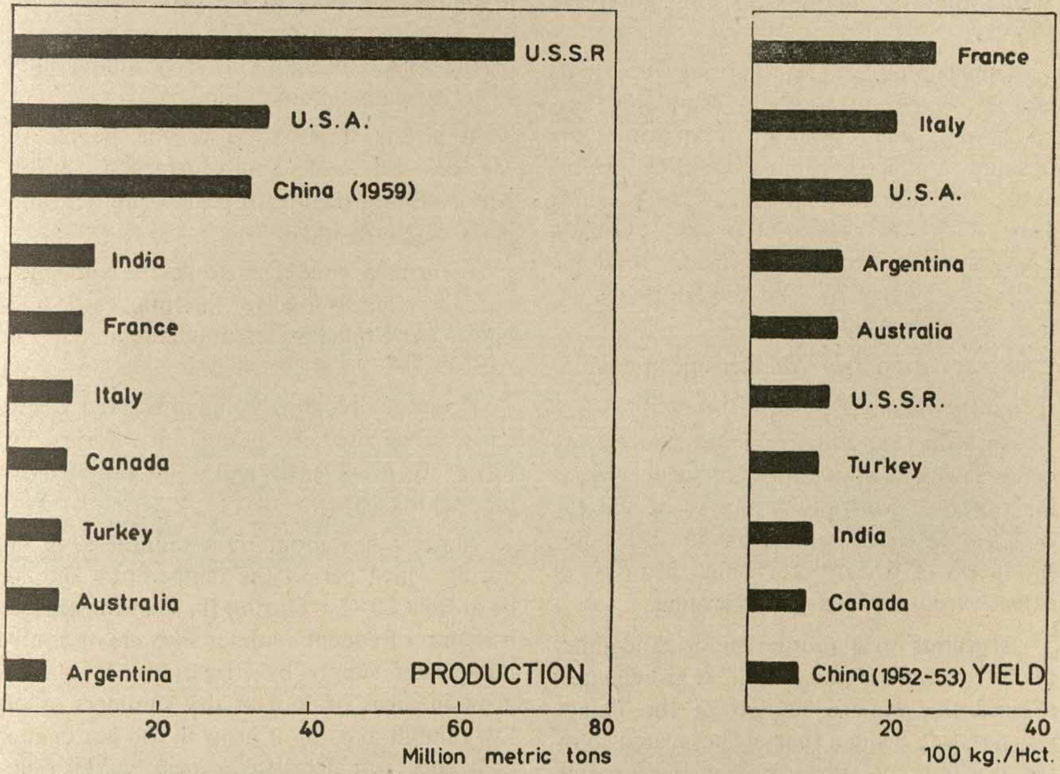


Fig. 12. Production and Yield of Wheat (1961)

Although wheat is grown in both temperate and tropical lands, the yields are higher in temperate lands on account of more favourable climatic conditions and better methods of farming. Why are some countries with a low yield per hectare able to export wheat to the countries where the yield is high? Name also the exceptions.

China follows the United States very closely in wheat production. Its main wheat-producing region is the North China Plain, the Hwang Ho lowland, and adjacent territories. China, however, has no surplus wheat for export.

India occupied the fourth position in the year 1961. Since then it has been overtaken by Canada and France. Its total yield was only one-sixth that of the Soviet Union. The Punjab, West Uttar Pradesh, Madhya Pradesh, Gujarat, and parts of Maharashtra and Rajasthan are the main wheat-growing regions. India has been trying to overcome its wheat deficit by increasing the yield per hectare.

France is the only West European country that is not only self-sufficient in wheat but exports it. It has been able to increase its production in recent years through high tariff. In humid regions, such as France, wheat is confined to the drier and sunny parts.

Italy is an important wheat-producing country in the Mediterranean region. Most of its produce is grown in the Valley of Po, where intensive methods of cultivation are adopted.

Canada produces mostly spring wheat in its prairies, chiefly in southern Manitoba, Saskatchewan, and Alberta. It improved its position in 1962 by almost doubling its production as compared to that of the previous year which was a poor-crop year. Canada is an important exporter of wheat. It adopts methods of extensive and mechanized commercial grain-farming.

Turkey is another Mediterranean country that produces wheat on a large scale.

Australia is an important wheat-producing country with large quantities of surplus wheat for exports. Murray-Darling basin and the South-West Australian regions are the major producers of wheat, practising methods of extensive commercial grain-farming.

Argentina is yet another important country of the Southern Hemisphere. It grows wheat around the western margin of the Pampa grasslands. Being a sparsely populated country, it is able to export wheat in large quantities.

New Zealand, Pakistan, United Arab Republic and several West and East European countries are among the other wheat-producing countries. New Zealand and Japan have a very high yield per acre. New Zealand is able to export wheat. Several West European countries, in spite of their high yield of wheat, are the major importers of wheat.

Wheat is the only cereal that enters the world market on a very large scale and can be had all the year round as fresh supplies are available every month, from some part of the world or the other.

Maize or Corn

Corn was the staple food of the ancient civilizations like Maya Aztec and Inca in the New World. It was Columbus who brought it for the first time to the Old World. Today its culture has spread to almost every part of the world owing to its easy adaptability to varied climatic conditions.

It is the staple food of the people in Mexico, parts of South America, South Africa, South-East European countries and parts of North India.

It forms a good feed for cattle and pigs, and, therefore, is used for fattening cattle and pigs in the United States, England, and South Africa.

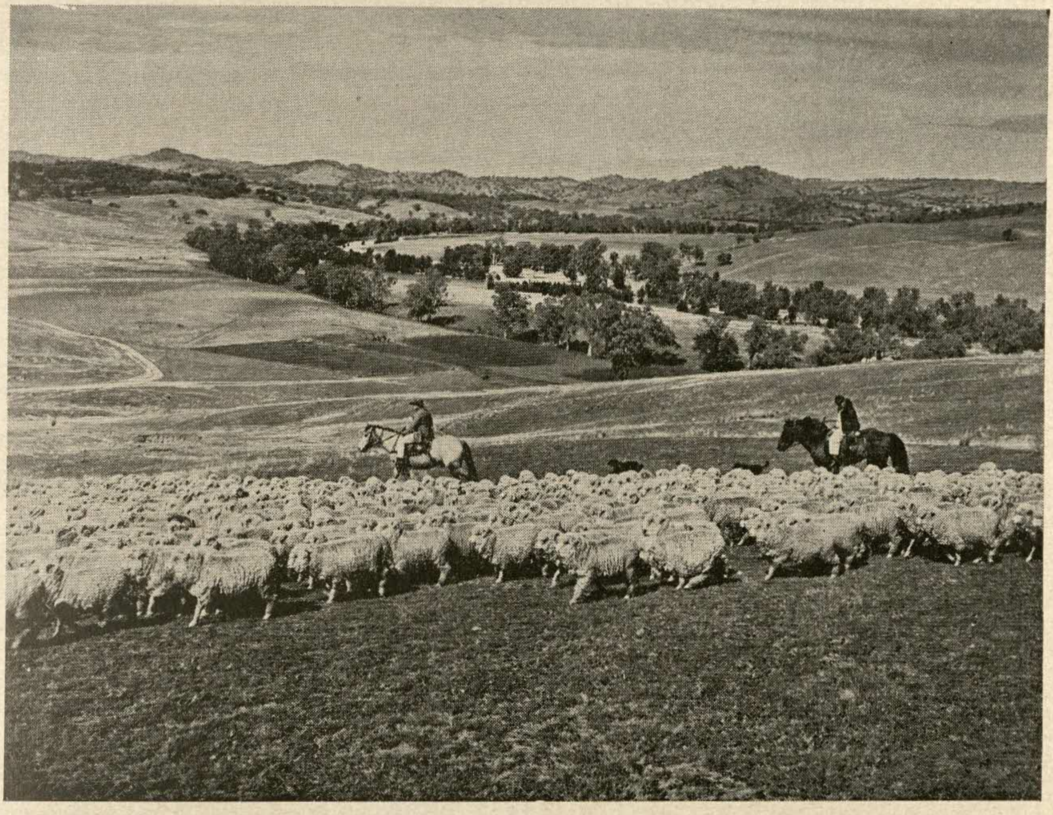
Corn can be stored and preserved easily and can be used as a food in a variety of ways. Its dried leaves and stems can be used for making paper.

Maize takes about three months to grow during which period the temperature should be at least 20°C. During the growing season it requires frequent summer showers or continual water supply by irrigation. It cannot grow in areas of cool or dry summers or of low rainfall, nor can it grow in too hot or too cold areas. It demands a deep, warm, rich, and well-watered soil.

In the United States, its main concentration lies in the famous 'corn belt', that is, the States of Nebraska, Iowa, Illinois, Indiana and Ohio lying between the wheat and cotton belts. (*See* picture 28.) Cattle and hogs are specially sent to this area to be fattened before they are taken to slaughter-houses.

The other producers are the Soviet Union, China, Brazil, Rumania, South Africa, Mexico, Argentina, and Yugoslavia (Fig. 13).

Corn is becoming popular in India also and is grown in parts of North India during the summer monsoon.



22. BENANGAROO: A FORTY THOUSAND-ACRE SHEEP FARM (*Courtesy*: *Australian News and Information Bureau.*)

Merinos are being mustered for shearing in this sheep and cattle farm in New South Wales. In the background is a tributary of the Murray, winding from the Australian Alps. What kind of landscape and pasture do you see in the picture?

23. MACHINE SHEARING (*Courtesy*: *Australian N. and I. Bureau.*)

Machines are used in shearing the 152 *million sheep of Australia. Is this task easy? Do you know how wool is graded?*

24. WOOL GOES TO MARKET (*Courtesy*: *Australian N. and I. Bureau.*)

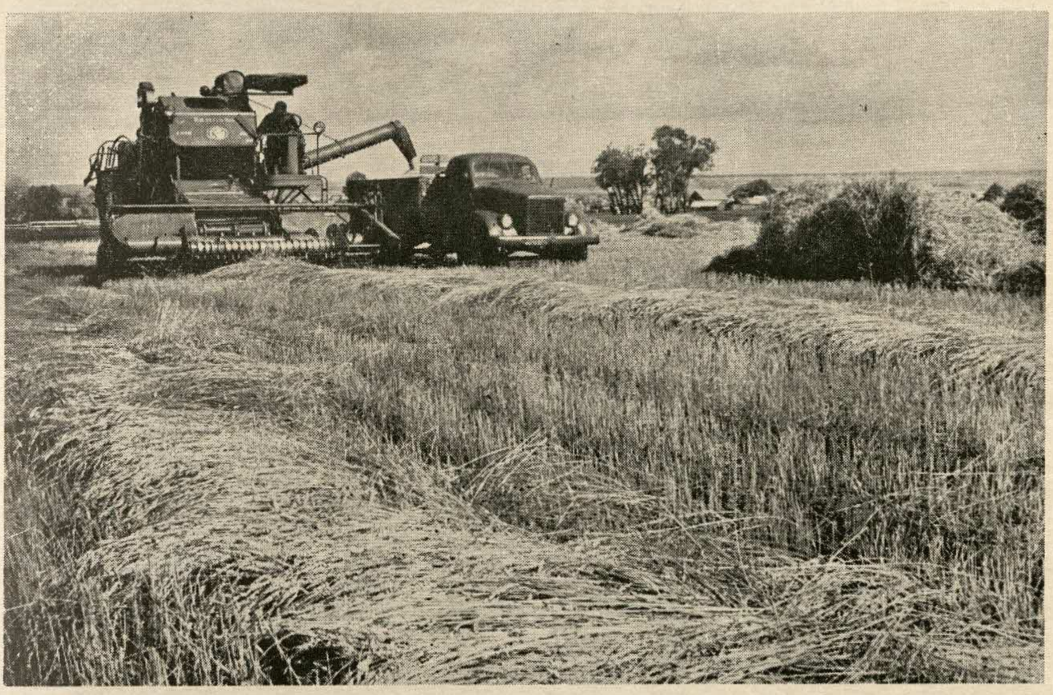
Australia produced 4,392,000 *quintals of wool in* 1961, *nearly* 30 *per cent of the world output. The picture was taken in the month of September when shearing was still going on in the south. What season was there?*

25. TERRACED PADDY FIELDS COVERING JAPAN'S COUNTRYSIDE (*Courtesy*: *Japan Information Centre, New Delhi.*)

The total arable land in Japan is only 13.9 *per cent of its total area mainly because of the mountainous topography. Every square inch of these* 14 *million acres is brought under cultivation as may be clear from these 'giant staircases along the hillsides'. Why does Japan follow intensive agriculture?*

26. JAPANESE METHOD OF RICE CULTIVATION AS FOLLOWED IN WEST BENGAL (*Courtesy*: *Japan Information Centre, New Delhi.*)

Systematic transplanting, careful manuring, weeding and controlled water supply characterize Japanese method of paddy cultivation. What are the other ways by which we can raise our yield per hectare?

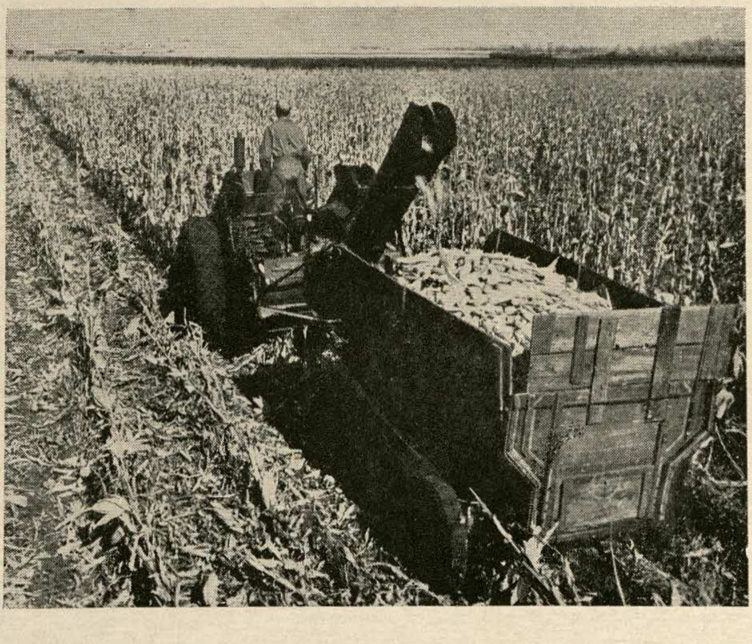


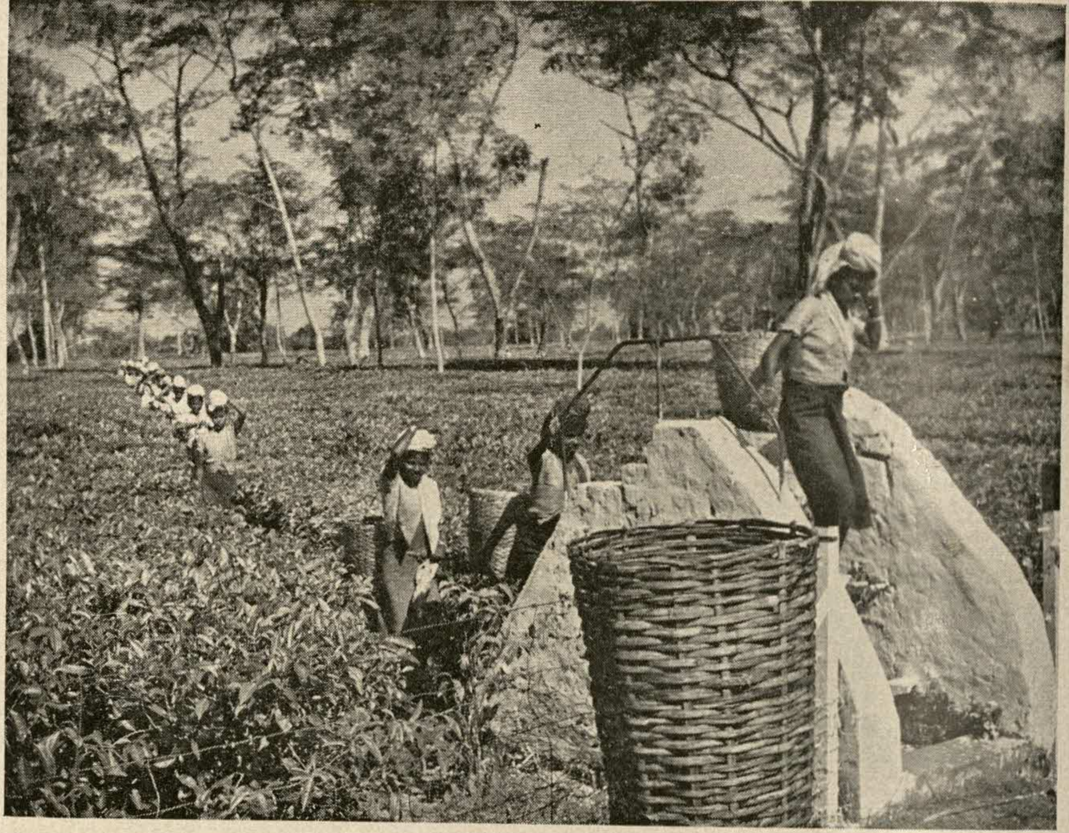
27. HARVESTING OF WHEAT ON A COLLECTIVE FARM (*Courtesy*: *Information Deptt. U.S.S.R. Embassy, New Delhi.*)

See the giant machine that harvests and threshes wheat. It is called a combine. What makes you think that the picture represents a good example of extensive commercial agriculture? Do you think large areas could be brought under cultivation without the use of such giant machines?

28. CORN-PICKING MACHINE AT WORK (*Courtesy*: *U.S.I.S., New Delhi.*)

This machine handles 5 to 6 hectares per day. Corn is a high-yielding crop. What are the different ways in which corn is used?



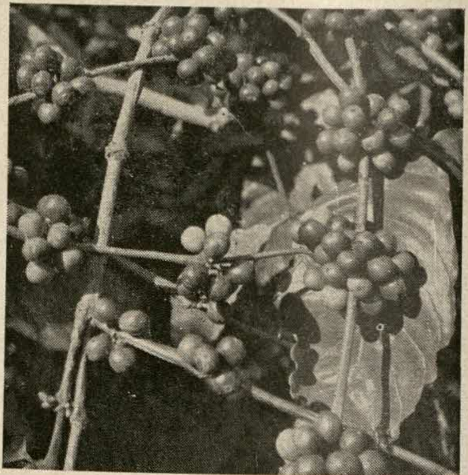


29. The Labourers in a Tea Garden in Assam (*Courtesy*: *Indian Council of Agricultural Research, New Delhi.*)

Note the flat lowlying and gently rolling nature of the terrain and the low height of the closely spaced tea bushes. Why is the proportion of female labour much greater in tea plantations than in coffee and rubber plantations?

30. Coffee Picking in the Brazilian Fazenda (*Courtesy*: *Brazilian Embassy, New Delhi.*)

Coffee plants originally the native of Ethiopia and Arabia have now made Brazil their favourite home. Winter, the season for coffee picking, is the busiest time on the Fazenda. What makes South-east Brazil an ideal home for the coffee plant?



31. Coffee Pods from Kerala (*Courtesy: Indian Council of Agricultural Research, New Delhi.*)

These coffee pods have to pass through various stages such as washing, drying, testing, blending, roasting and grinding before they can be used to prepare a delicious and refreshing cup of coffee with its characteristic flavour. Which other drink is similarly obtained from pods?

32. Sugar-Beet Crop in the North-West United States (*Courtesy*: *U.S.I.S., New Delhi.*)

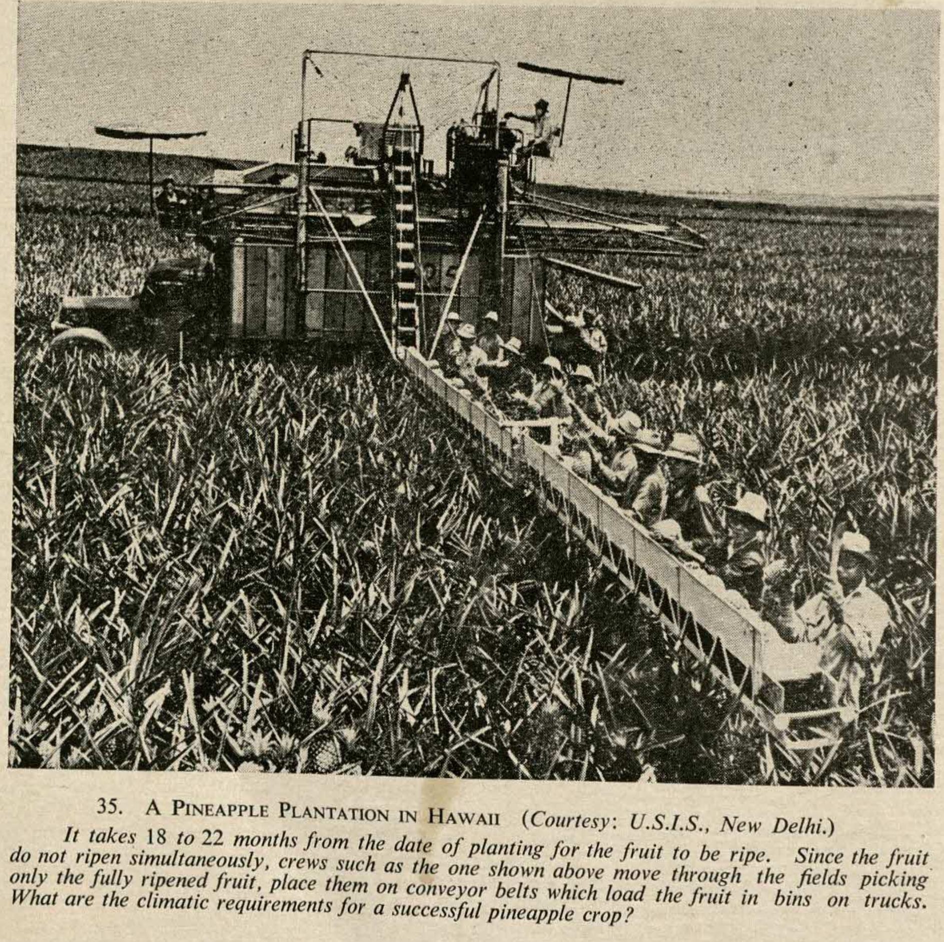
In 1836, eighteen pounds of beet yielded a pound of sugar. Today, only five pounds or less are enough to yield a pound of sugar. How would you account for this change? How big and heavy must be the beetroot that you see in the picture?

33. Harvesting the Sugar-cane Crop in India (*Courtesy*: *Indian Council of Agricultural Research, New Delhi.*)

The sugar content of the Indian cane is about 10 per cent while that of the Hawaiian cane is about 15 per cent. Hawaiian sugar-cane farms yield 17 or 20 tons of sugar per hectare, whereas it is less than five in India. How would you explain this?

34. Seedless Grapes (*Courtesy*: *U.S.I.S., New Delhi.*)

A farmer in California inspects his prized crop of seedless grapes, most of which is used for raisins. Which other countries produce grapes (a) for raisins and (b) for wines?



35. A Pineapple Plantation in Hawaii (*Courtesy*: *U.S.I.S., New Delhi.*)

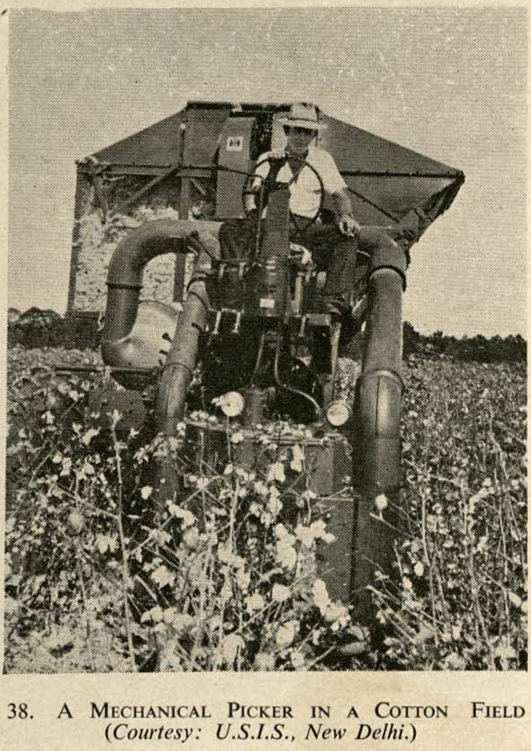
It takes 18 to 22 months from the date of planting for the fruit to be ripe. Since the fruit do not ripen simultaneously, crews such as the one shown above move through the fields picking only the fully ripened fruit, place them on conveyor belts which load the fruit in bins on trucks. What are the climatic requirements for a successful pineapple crop?

36. Jute Crop Ready for Harvesting (*Courtesy: Indian Council of Agricultural Research, New Delhi.*)

Jute plants grow two to four metres tall in the Ganga-Brahmaputra delta, hardly needing any fertilizers or rotation of crops. Individual fibres are two to three metres long, and are soft, strong and of uniform length and size. They can also be readily bleached. What gives this particular region the world monopoly in jute?

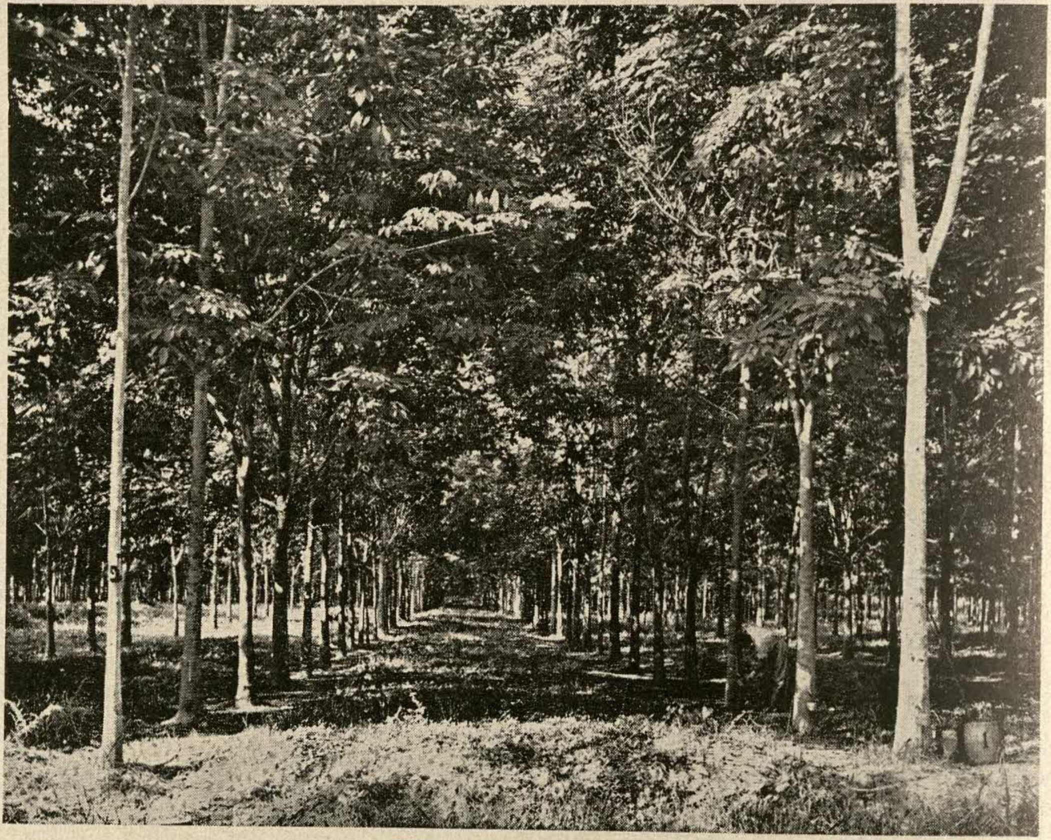
37. Feeding the Silkworms on Mulberry Leaves (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

These tiny caterpillars are kept on trays for nearly six weeks before they begin to spin cocoons round themselves. During these 42 days they are fed on mulberry leaves. At one meal a silkworm can consume leaves twenty times its own weight! To what part of India does the woman in the picture belong?



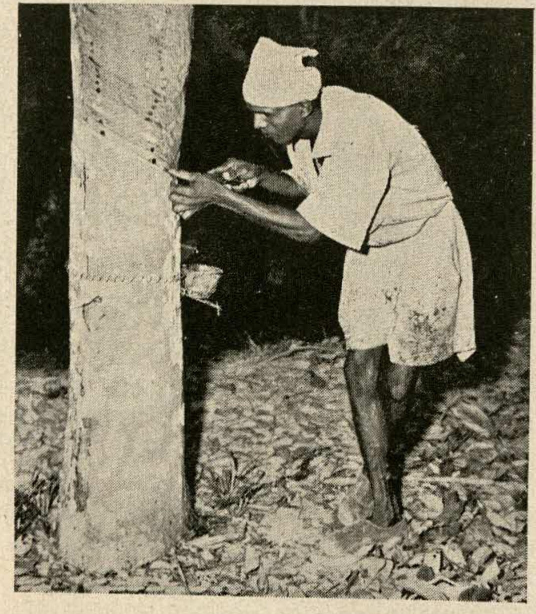
38. A Mechanical Picker in a Cotton Field (*Courtesy: U.S.I.S., New Delhi.*)

Moving slowly through the field a mechanical picker harvests cotton at the rate of eleven bales a day! How have new farming techniques helped the return of cotton to the abandoned estates of the South [illegible] *United States?*



39. A TYPICAL RUBBER ESTATE IN MALAYSIA (*Courtesy: Malaysian High Commission, New Delhi.*)

Rubber sustains about 30 *per cent of the total population of Malaysia. It has* 64 *per cent of its total cultivated area under rubber and accounts for one-third of the total world production of natural rubber. What makes it possible for Malaysia to devote so much of its cultivated land to rubber?*



40. RUBBER TAPPING (*Courtesy: Malaysian High Commission, New Delhi.*)

Look at the sloping groove along which oozes out the white milky latex that drips by gravity into a cup placed below the cut bark. Each tapper is responsible for 350 *trees like this. There are* 250,000 *tappers employed in Malaysia to look after* 1,600,000 *hectares of land under rubber. How does the tapping of latex compare with the collection of resin from pine trees?*

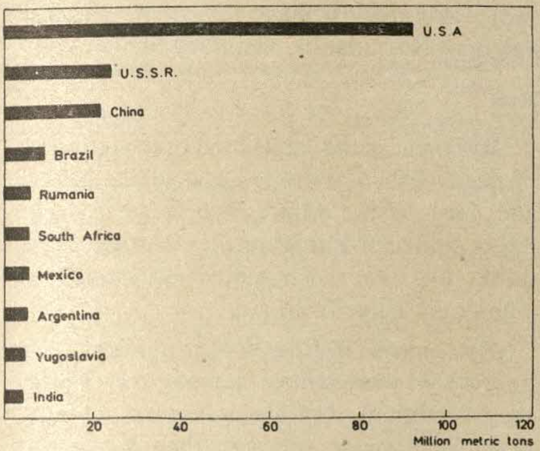


Fig. 13. Production of Maize (1961)

The United States accounts for over 50 per cent of the world's annual production, where it is largely converted into beef and pork through cattle and pigs. Explain how it is done.

Millets

Coarse grains like *jowar*, *bajra*, and *ragi* grown in India are called millets. They are known by different names in different countries, for example, *dari* or *dhura* in Africa, *sorghum* in Guinea, and *sorghum* and *kaoliang* in China.

Millets are grown in areas with high temperature, low rainfall and inferior soils. They grow well in the semi-arid parts of tropical and sub-tropical areas where rice or wheat cannot be successfully grown.

From the international point of view they are insignificant and do not enter into international trade. Nevertheless, they are the staple food of millions in India, Africa, China, and Japan. In the United States, millets are grown for feeding domestic animals.

Oats

Oats are a spring-sown crop requiring less warmth and more water and so are a crop of the cool, damp climates. They are capable of growing in inferior soils, as compared to wheat and barley. They are grown in the areas north of the spring-wheat belt where wheat cannot thrive.

They are mainly used for feeding cattle, pigs, and particularly horses. They are also used for human consumption in damp regions like Ireland, Scotland, and the Scandinavian countries. They are used for the preparation of malts.

The important producers of oats are the United States, the Soviet Union, Canada, Poland, France, Germany, the United Kingdom, Sweden and Australia. Countries around the North Sea also grow oats for feeding their dairy cattle (Fig. 14).

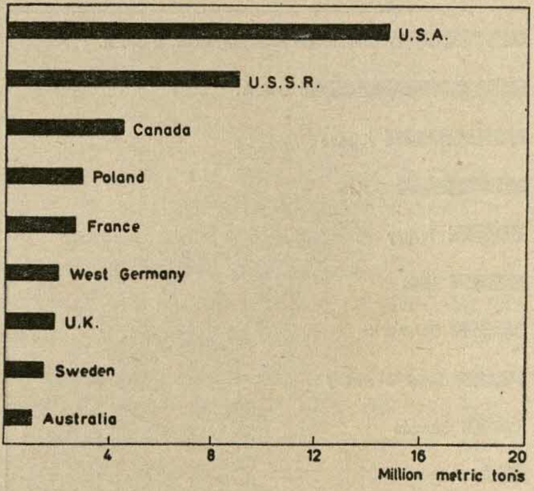


Fig. 14. Production of Oats (1961)

They are the king crop in the regions of poor soils and cool and damp climates. Their large bulk per unit of value makes them less convenient for international trade. Where and in what season could one see oat fields in India?

Barley

Barley is one of the oldest cultivated grains. It being an old cultivated plant, a large number of varieties adapted to contrasting environments have been developed. It is used as human food in Japan, parts of India, Scandinavia and North Africa. It is now mainly used in the preparation of alcoholic drinks like beer and whisky.

Barley grows on the poorer and lighter soils, the better ones being devoted to wheat. It matures quickly even at low temperatures and is grown in areas with short northern summers. It is also grown in high mountain valleys for the same reasons. Growing beneath the midnight sun, it ripens even 250 kilometres beyond the Arctic Circle, that is, up to 70°N. It grows on the Tibetan Plateau at altitudes more than 3,000 metres above sea level. It also flourishes well in the arid regions of Australia as well as in Algeria, and several other North African countries (Fig. 15).

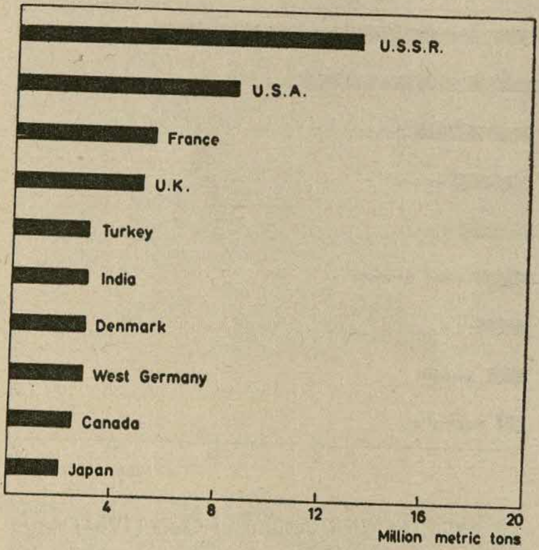


Fig. 15. Production of Barley (1961)

Among the continents, Europe holds the first rank in barley production. Compare and contrast the climatic requirements for the production of oats and barley.

The important producers are the Soviet Union, the United States, France, the United Kingdom, Turkey, India, Denmark, Germany, Canada, and Japan.

The exporters of barley are the Soviet Union, Australia, Algeria, Iraq, Morocco, Canada, and the United States. Barley is imported by the beer drinking countries such as the United Kingdom, France, Belgium, Netherlands, Germany and Japan.

Rye

Rye bread is the staple food of the peasants of nearly half of Europe—east of the Rhine and north of the Alps. Rye bread is dark, heavy, and sour but is nutritious. Alcoholic drinks like the *vodka* and some brands of whisky are made from rye.

Rye grows in the cooler climates and poorer soils where wheat cannot grow. Under these conditions, it produces heavier and more dependable yields per acre than wheat. It is the heaviest of the winter grains. It grows in areas where the winter temperatures average 17°C below the freezing point, and occasionally reaching to minus 40°C.

Rye is produced in the Soviet Union, North and Central Europe, the United States, and Canada.

Oil-seeds

Oil-seeds are not cereals, but they give us edible oils which are very important to us as suppliers of fat. These vegetable oils are used in cooking. They are also used in the manufacture of margarine, soap, candle, paints, and varnishes. They are obtained from the seed or fruit of some plants.

Linseed Oil—It is obtained from the seeds of the flax plant. Besides being used as an edible oil, it is used in preparing paints and varnishes and in seasoning of wood. Canada, India, Argentina, Uruguay and the United States are the chief producers and exporters of this oil.

Olive Oil—Olive is a wonderful food producer, and grows in poor, rocky hillsides in the Mediterranean lands. Fat or oil derived from olives is a substitute for butter in these lands. More than a million tons of olive oil is produced in this part of the world, two-thirds of which is accounted for by Spain and Italy alone. Then comes Greece as the third largest producer. The chief exporters are Spain, Tunisia, Algeria and Portugal.

Coconut Oil—Tropical lands such as Ceylon, Indonesia, Malaysia, the Philippines and the Pacific Islands produce coconut oil from the kernel of the coconut or the copra. It is exported to the United States and the West-European countries.

In India, Kerala, the land of coconuts, produces coconut oil. But India has to import coconut oil to meet its domestic demands.

Palm Oil—In equatorial rain forests in the neighbourhood of the Gulf of Guinea, there is a wild growth of oil-palms. They provide both food and oil and as such have become a good cash crop. Nigeria, Ghana, and the Congo export oil to European countries and to the United States for making candles, soap, and margarine.

Ground-nut Oil—The ground-nut plant grows well in dry light soils in the tropical and sub-tropical areas. The oil derived from ground-nuts or peanuts is used for cooking and for making soaps, candles and margarine. Its cake is a useful feed for dairy animals and a good manure for soil. Thirty lbs. of peanuts yield a gallon of oil and 20 lbs. of oil-cake. It is going to be one of the greatest crops of the future. Its oil is found to be as nutritious as cheese because of its high content of protein.

The main producers of peanut oil are India, China, France, Africa, the United States, Nigeria, Argentina, Kenya, and Tanganyika.

Other Oil-seeds—Rape-seed, sesamum, castor oil seeds, cotton seeds, and mustard are some of the other important seeds, many of which are grown in India.

Rape-seed is grown in Rumania and India, sesamum in India and China, castor seeds in India, and soyabeans in China, Korea, and the United States. Although cotton is grown in many countries, cotton seeds are exported mainly by Sudan, Nigeria, India, and the United Arab Republic. Mustard oil is produced and consumed in North India on a fairly large scale.

Most of the oil-seeds of India give edible oils. These are used in cooking and the cake that remains after extraction of the oil is used as cattle feed and manure. The non-edible oils are used in medicine, and in making paints, varnishes, and lubricants.

These days, many edible oils are hydrogenated. Such hydrogenated oils resemble *ghee* and are often used in place of *ghee*. These oils are popularly known as *vanaspati*. This vegetable oil industry in India has grown considerably during the last twenty years or so.

EXERCISES

Review Questions

1. Answer the following questions as briefly as you can:

(*i*) How would you define agriculture?

(*ii*) What change did agriculture bring about in the life of primitive man?

(*iii*) What are the different patterns of agriculture due to?

(*iv*) What are the different types of produce derived from agriculture? Give two examples of each.

(*v*) Name different types of agriculture and the relationships they have with density and nature of population.

(*vi*) How does rotation farming benefit a farmer?

(*vii*) What is a terraced farm and where are they found in India?

(*viii*) What are the salient features of the Japanese method of paddy cultivation?

(*ix*) State why shifting agriculture is sometimes compared to bee-hiving.

2. Compare and contrast:

(*i*) Shifting *versus* settled agriculture.

(*ii*) Subsistence *versus* commercial farming.

(*iii*) Intensive *versus* extensive agriculture.

(*iv*) Spring wheat *versus* winter wheat.

3. Discuss intensive commercial mixed farming in all its aspects explaining how it differs from commercial grain-farming and intensive farming. What role in your opinion can it play in Indian agriculture?

4. Give a detailed geographical account of wheat-farming in different parts of the world and the position which wheat occupies in international trade. Trace the role played by climatic conditions and cultural factors in evolving differing patterns of wheat-farming.

5. Use a single technical term for each of the following:

(*i*) A method of sowing seeds by scattering them in the field.

(*ii*) Farming in which large amounts of capital and labour are applied per unit of area to get maximum return.

(*iii*) Crops sown soon after the onset of the monsoons and harvested in autumn in India.

(*iv*) Bringing large areas under the plough with the minimum use of labour or manpower.

(*v*) One-crop farming on a large scale resembling factory production.

6. Listed below are certain conditions of growth of rice, wheat, maize, and barley. Group them under respective cereals to which they belong:

(*i*) Grows even beneath the midnight sun.

(*ii*) A uniform temperature of 25°C during the growing season.

(*iii*) Plentiful and co-operative labour.

(*iv*) Grows in poorer and lighter soils.

(*v*) Temperature of 20°C for at least three months.

(*vi*) Cool and moist climate during the period of early growth.

(*vii*) Loamy, well-drained soils rich in nitrogenous matter.

(*viii*) Level farms with alluvial top-soil underlain by clayey impermeable subsoils.

(*ix*) Deep, warm, rich and well-watered soils.

(*x*) Freedom from frost for at least 90 days.

(*xi*) Undulating topography is suited to its extensive commercial farming.

(*xii*) Practice of transplantation ensures higher yields.

(*xiii*) A rainfall of about 50 to 75 cm.

(*xiv*) Can grow at an altitude of 3,000 metres and even above.

7. Choose the right ending and complete the following statement:

The most salient feature of plantation agriculture is that:

(*i*) it involves transplanting of seedlings.

(*ii*) it requires the planting of trees or crops every few years.

(*iii*) it must be in very large holdings.

(*iv*) it is a scientific and highly specialized production of a single crop grown on a commercial scale.

(*v*) it should have a plant or factory of its own.

Finding Out

1. Find out all that you can about the food problem in India with special reference to the major cereals—rice, wheat, and millets—their production and consumption. Collect figures for the last five years and write a critical note on them.

2. Consult the following references and write a brief but self-contained note of not more than 30 lines on rubber plantations in Malaysia. See that your note brings out pointedly (*i*) the place of rubber plantation in Malaysia's national economy, (*ii*) contribution of foreign labour, capital and management and (*iii*) its impact on the life of the local people.

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Cartographic Work

(*i*) Convert the data collected by you for item 1 above into suitable graphs and cartograms.

(*ii*) See if you can prepare an instructive poster to support our national slogan—"Grow two grains where only one used to grow".

(*iii*) Collect figures for rice production, acreage and yield per hectare in different States of India and show them diagrammatically.

Picture Reading

(*i*) Compare the pictures, "A Collective Farm in the Soviet Union" and "Transplanting Rice in an Indian Paddy Field".

List as many differences as you can in the physical and cultural environments and farming practices in the two situations.

(*ii*) Compare the pictures "Harvesting Maize in the United States" and "Terraced Rice Fields in Japan".

Would you recommend large-scale mechanized farming to the Japanese farmer and intensive methods to his American counterpart? Support your stand with careful arguments.

Films Available

i. Man Learns to Farm. 10 mins; English/Hindi; U.S.I.S.
ii. Machines and the Farm. No. 2425; 32 mins; English; B.I.S.
iii. Tropical Forest Village. No. 916.7; 10 mins; English; D.A.V.E.
iv. How to Grow More Paddy. No. 633; 22 mins; Hindi; D.A.V.E.
v. A New Method of Rice Production. No. 70; 30 mins; English; J.I.C.
vi. Agriculture in Japan. No. 72; 30 mins; English; J.I.C.
vii. The Wheat Farmers. No. 633.1; 11 mins; English; D.A.V.E.
viii. Canadian Wheat. 31 mins; English; C.H.C.
ix. Canadian Wheat Story. No. 633.1; 6 mins; English; D.A.V.E.
x. The Wheat Farmers. No. 633.1; 11 mins; English; D.A.V.E.
xi. The Story of Wheat. S.No. 88; 10 mins; English; A.H.C.
xii Corn. 15 mins; English/Hindi; U.S.I.S.
xiii. Grain That Built A Hemisphere. 11 mins; English; U.S.I.S.
xiv. Co-operative Farming. No. 630.62; 11 mins; English/Hindi; D.A.V.E.

Further Readings

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CHAPTER 5

Agriculture—Other Products

BESIDES cereals and oil-seeds, we obtain a large variety of produce from the soil by agriculture. Beverages like tea, coffee, and cocoa that refresh us are derived from the land. The two most important sources of sugar, namely, sugar-cane and sugar-beet, are grown on the farms. A large variety of fruits which are so necessary for a balanced diet are the products of agriculture, particularly fruit gardening.

Agriculture provides us not only with food but also with fibres for clothing. Cotton, flax, hemp and jute are the well-known fibre-crops that we derive directly from the fields. Although raw silk is connected with agriculture rather indirectly, sericulture is considered to be a kind of farming. Important industrial raw material like rubber is also a product of plantation agriculture. Finally, dairy products like milk, cheese, and butter are the result of yet another kind of agriculture known as dairy farming.

Tea

Tea is a very popular drink in Great Britain, New Zealand, Australia, Ireland, Canada, the United Arab Republic, the Netherlands, the Soviet Union and Tibet, besides the tea growing countries—India, Ceylon, China, and Japan.

As a refreshing drink, tea has been in use in China for several centuries. Tibet and Japan also have been using it for a long time. Europe came to know of it only as late as the 17th century. China was the main supplier of tea and continued to be so till 1838 when for the first time Indian tea was sold in London.

Tea plantation in India was started in 1823 when wild tea-plants were discovered by the British in the Assam jungles. It suggests that the original home of the tea-plant was in a region that spread over parts of both India and China.

The warm summers of the monsoon lands with abundant rainfall occurring in frequent showers practically all through the year, are suitable for the cultivation of tea. An annual rainfall of about 200 centimetres distributed throughout the year and an average summer temperature of about 25°C are essential for the good and continual growth of tea-leaves.

Tea requires a deep, well-drained, fertile soil. A little iron in the soil is particularly helpful. Slopes of the hills as in the Nilgiris of South India or well-drained valleys like those in Assam are ideal sites (Fig. 16).

The plant may grow to the size of a small tree, but it is not allowed to grow beyond a height of about a metre or a metre-and-a-quarter as the leaves have to be hand picked. (*See* picture 29.)

Regular pruning maintains the proper height of the plant and also helps in the growth of new shoots. In China, the leaves are picked three or four times during the year but in India they are picked at intervals of about ten days during the picking season from September to May. In Ceylon and Indonesia, the leaves are picked all through the year.

After the leaves are gathered, they are withered, rolled, partly fermented, dried, and sifted. Elaborate modern machinery is used for rolling, blending, and fermenting the leaves to give them the required flavour.

Besides the investment of huge capital,

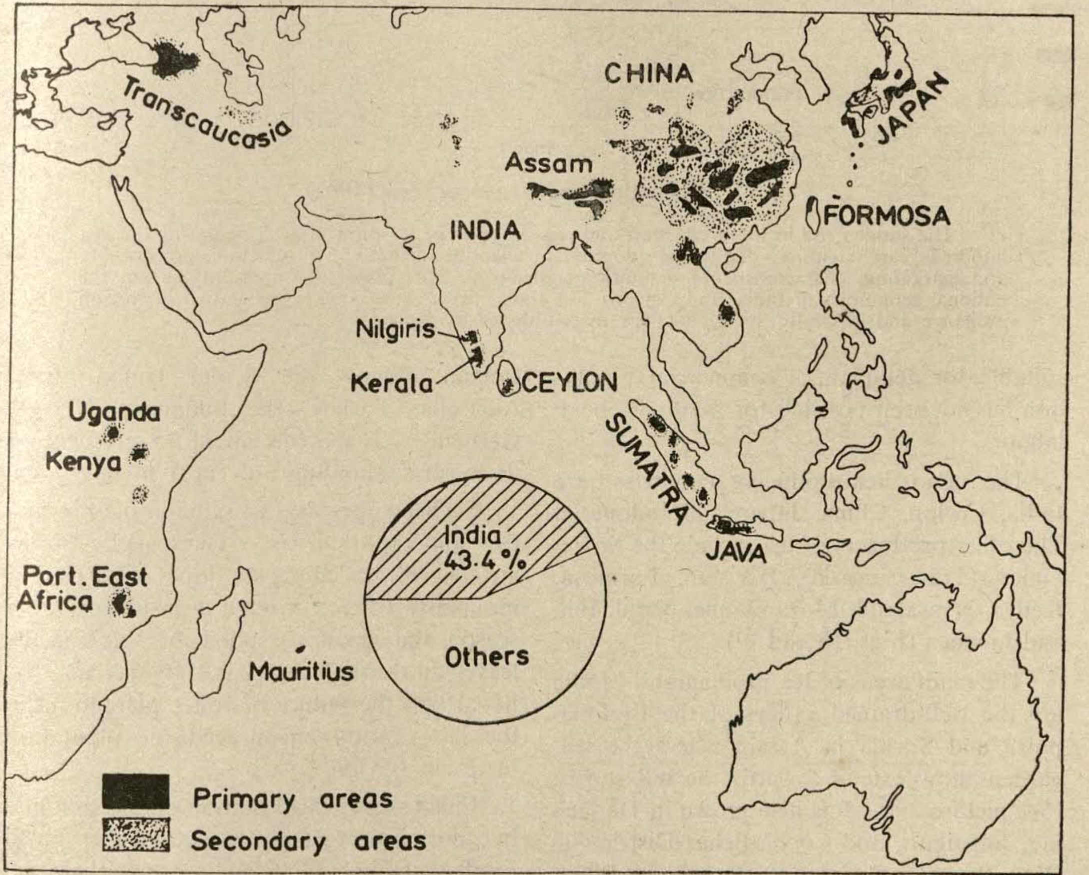

Fig. 16. Tea-producing Regions. (Adapted from C.F. Jones and G.G. Darkenwald.)

Subsistence and commercial tea production is confined largely to Eastern and Southern Asia. Whereas China grows tea mostly for its own consumption, India and Ceylon are engaged in scientific and commercial farming for the world market. What are the geographical conditions necessary for a tea plant? Explain why tea is not a major crop in the areas lying outside the map.

one of the important requisites of a successful tea plantation is the availability of enormous cheap labour, deft at plucking tea-leaves. In regions like South-East Brazil and South Carolina, where climatic conditions are fairly suitable for tea-plants, commercial plantation has not been possible for want of cheap labour.

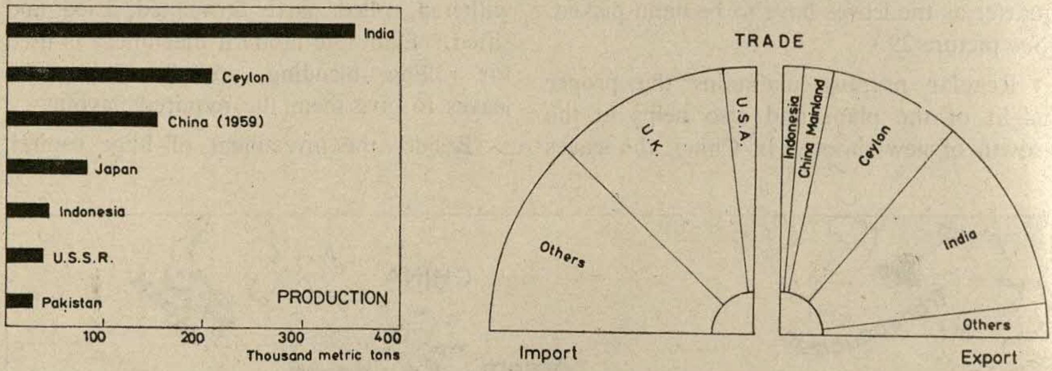

Fig. 17. Production and Trade of Tea (1961)

The sudden rise in the production and consumption of tea on a large scale during the last hundred years is entirely due to the adoption of scientific methods of production, preparation, and marketing, characteristic of plantation agriculture. Tea plays an important part in the national economies of India, and Ceylon. For India, tea is the second largest earner of foreign exchange and in Ceylon it accounts for three-fifths of its exports.

The major tea-producing countries are India, Ceylon, China, Japan and Indonesia. The other producers of tea include the Soviet Union (Transcaucasia), Pakistan, Formosa, Kenya, Nyasaland, Mozambique, Natal, Fiji, and Jamaica (Figs. 16 and 17).

The main areas of tea production in India are the well-drained valleys of the Brahmaputra and Surma in Assam where the tea-gardens now extend towards the hill slopes. (*See* picture 29.) It is also grown in Darjeeling, Jalpaiguri, and Cooch-Behar Districts in West Bengal. Areas near Ranchi in Bihar, the Kumaon and Garhwal Hills in Uttar Pradesh, and the Kangra Valley in the Himachal Pradesh are the other tea-producing areas of North India. In the south, the slopes of the Nilgiris, the Palnis and the Anamalais in the States of Madras, Mysore, and Kerala are utilized for growing tea.

India is the chief exporter of tea to the United Kingdom, the United States, Canada, Ireland, Egypt, the Soviet Union, Iran, Australia, Turkey, the Sudan, and West Germany. Tea forms about 15 per cent of its exports, standing only next to jute.

Ceylon comes next to India in the production and export of tea. The tea plantations are concentrated along the slopes of the central mountains where, through a prolonged rainy season, the climate is suited for plucking the leaves all through the year. It may also be noted that the failure of coffee plantations in the last century encouraged the plantation of tea in Ceylon.

China stands third both in production and in export; but most of its produce is consumed locally. Unlike India and Ceylon, there are no extensive plantations; the gardens are small in size and modern methods of preparation are not followed.

Japan ranks next to China in production, but again in small gardens; most of the produce is consumed locally. The Japanese are very fond of tea. For centuries they used to celebrate an elaborate tea drinking ceremony called *Cha-no-yu.*

Indonesia has sizable areas under plantation in Java and stands next to China in export.

Coffee

Next to tea, coffee is the most popular beverage. It is a very popular drink in the United States, Sweden, Belgium, Denmark, France, Germany, and some other countries. The United States alone imports more than half of the world produce of coffee. In India coffee is more popular in the south than it is in the north.

Coffee powder is obtained by grinding the roasted beans or berries of the coffee-plant. This plant was brought to Yemen in south-east Arabia from the province of Kaffa in Ethiopia, where it was known centuries back. For about two centuries, coffee was the monopoly of Arabia. But then the consumption of coffee was meagre. Turks took it to Europe in the 17th century and the Dutch eventually carried it to the East Indies.

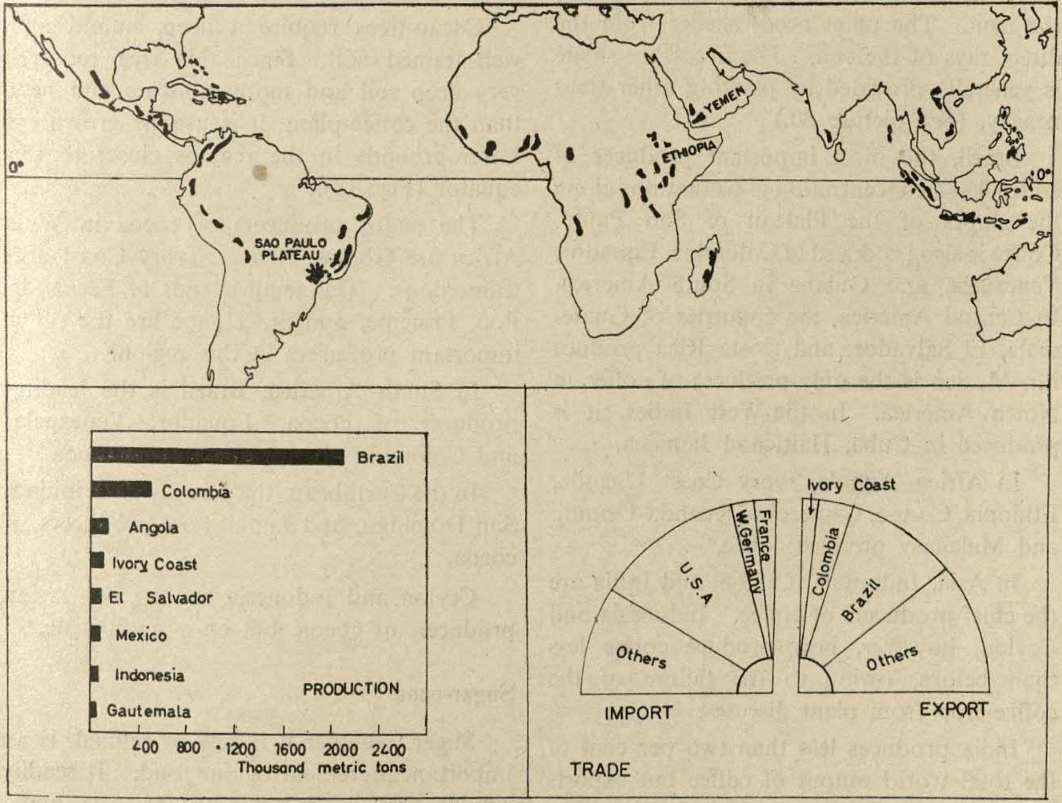

Fig. 18. World Distribution of Coffee (1961) (After C.F. Jones, and G.G. Darkenwald.)

Coffee is the product of tropical hill slopes, plateaus, and mountains. Brazil alone accounts for more than half the world produce. Latin America accounts for more than four-fifths of all exports, and the United States for more than half the world imports. Compare the trends in the trade of coffee with those of tea.

The coffee-plant requires an average temperature of 18°C to 25°C and a rainfall of 100 to 175 centimetres.

Coffee needs a rich, well-drained soil preferably derived from igneous rocks. Coffee grows best in tropical highlands at altitudes varying from 900 to 1,800 metres. It is grown on a variety of soils, but the soils, derived from igneous rocks (basalts) known as *Terra Roxa* (red earth) in Brazil, are famous for high yields (Fig. 18).

The trees may grow to a height of about 9 to 10 metres but by pruning they are maintained at a height of about two-and-a-half to three metres, which is suitable for plucking the fruit. The plant needs shelter from the direct rays of the sun. The necessary shade is generally provided by planting other trees nearby. (*See* picture 30.)

Brazil, the most important producer of coffee, has a concentration of plantations along the slopes of the Plateau of Sao Paulo. Coffee is also produced in Colombia, Equador, Venezuela, and Guiana in South America. In Central America, the countries of Guatemala, El Salvador, and Costa Rica produce it. Mexico is the only producer of coffee in North America. In the West Indies, it is produced in Cuba, Haiti and Jamaica.

In Africa, Angola, Ivory Coast, Uganda, Ethiopia, Congo, Cameroon, Ruanda-Urundi, and Malagasy produce coffee.

In Asia, Indonesia, Ceylon, and India are the chief producers of coffee. Indonesia and Ceylon, however, now produce coffee less than before, owing to the failure of the coffee-crop from plant diseases.

India produces less than two per cent of the total world output of coffee but exports half of it to Europe and Australia. The States of Madras, Kerala, and Mysore produce coffee in India. (*See* picture 31.)

Cocoa

Although cocoa is not so popular a drink as tea or coffee, it is used in chocolates and other forms of confectionery, which are consumed in large quantities in Europe and America.

Cocoa-powder is obtained by grinding cocoa-beans. Half the content of the beans is cocoa-butter some of which is retained while making chocolate and confectionery.

Cacao, that is the cocoa-tree, thrives well in an equatorial climate of great heat and humidity. A temperature of over 26°C and a well distributed rainfall of at least 125 centimetres are the main climatic requirements. The young plant needs shelter from wind and direct sun.

Cacao-trees require a deep, humid and well-drained soil. Since this tree requires very deep soil and more moisture and heat than the coffee-plant, it is usually grown on lower grounds in the regions closer to the equator (Fig. 19).

The major producers of cocoa in West Africa are Ghana, Nigeria, Ivory Coast and Cameroons. The small islands of Fernando Poo, Principe, and St. Thome are the other important producers in this region.

In South America, Brazil is the leading producer of cocoa. Equador, Venezuela, and Colombia also produce some cocoa.

In the Caribbean, the Islands of Trinidad, San Domingo, and Jamaica are producers of cocoa.

Ceylon and Indonesia are the two Asian producers of cocoa, but on a small scale.

Sugar-cane

Sugar, whether it is raw or refined, is an important ingredient of our food. It readily supplies the heat necessary to our body. The two main sources of sugar are sugar-cane and sugar-beet. It is also obtained from the sap of the maple tree and from grapes, dates, and maize.

Sugar-cane is a kind of grass with a thick stem. It was first developed in India to yield sugar.

The sugar-cane needs a hot, moist climate. The temperature necessary is about 28°C and a rainfall of about 100 centimetres to 175 centimetres. Since the cane takes about a year or even more to mature, it can grow only in a land of long or continuous growing season. Moreover, much sunshine is required particularly at the end of the growing season to evaporate the liquid in the stem of the plant and thereby increase its sugar content (Fig. 20).

The sugar-cane needs a level land and a heavy well-drained soil. Fertile soils with a high water-holding capacity and yet well-drained are more suitable. Sugar percentage in the cane decreases if water accumulates in the field. Since the cane takes away nitrogen, calcium, and potash from the soil, manures and fertilizers are to be used to maintain the fertility of the soil.

The crop takes nearly a year or even more to mature. The cane, when cut, has to be taken immediately to the sugar factory where it is crushed. The juice is then boiled and

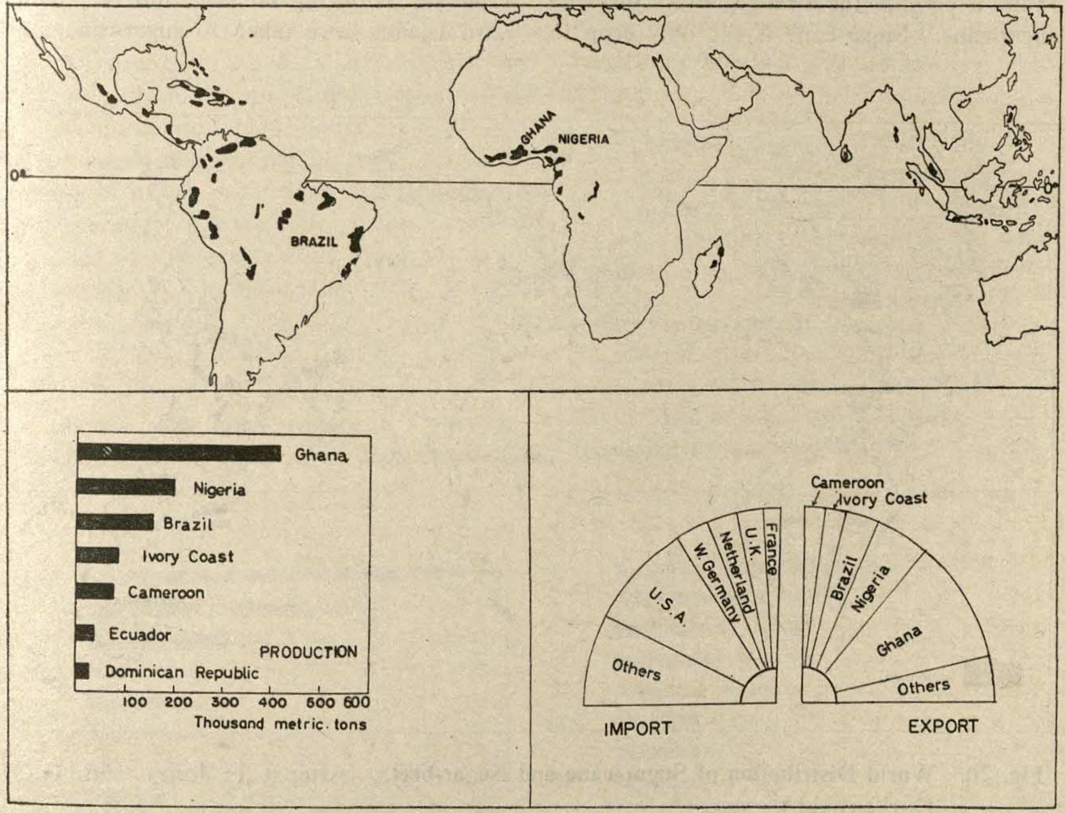

Fig. 19. World Distribution of Cocoa (1961) (Adapted from C.F. Jones and G.G. Darkenwald.)

Cocoa is a crop of the hot-wet tropics. Africa, especially the regions along the Gulf of Guinea, now produces about two-thirds of the world exports. Very little cocoa is consumed in the areas of production. Compare the climatic and soil requirements of cocoa and coffee plants.

lime is added to clarify it. The thick juice is then made into crystalline sugar or *gur*.

The molasses which remain are distilled to produce either rum alcohol, or methylated spirit, as by-products which cut down the cost of production. The crushed stems, the bagasse, can be used for the manufacture of paper.

A good deal of local manual labour is essential for growing sugar-cane. This is easily available in the tropical areas.

Principal Areas of Production

Cuba and the West Indies—The West Indies is perhaps the ideal region for growing sugar-cane. Sugar-cane is the only crop in many of these islands. The physical condition of soil and climate, the availability of cheap local labour, the huge investments of American and European capital, and the proximity of the great American and European markets for sugar, are together responsible for the rapid growth of sugar-cane cultivation and sugar production.

Cuba, which is now an independent country, is alone responsible for about 12 per cent of the world production. The sugar-cane plantations were developed in Cuba, Puerto Rico, and Dominica with American capital. The islands of Barbados, Antigua, Trinidad, Tobago, Jamaica, and the Windward Islands have taken to sugar-cane culti-

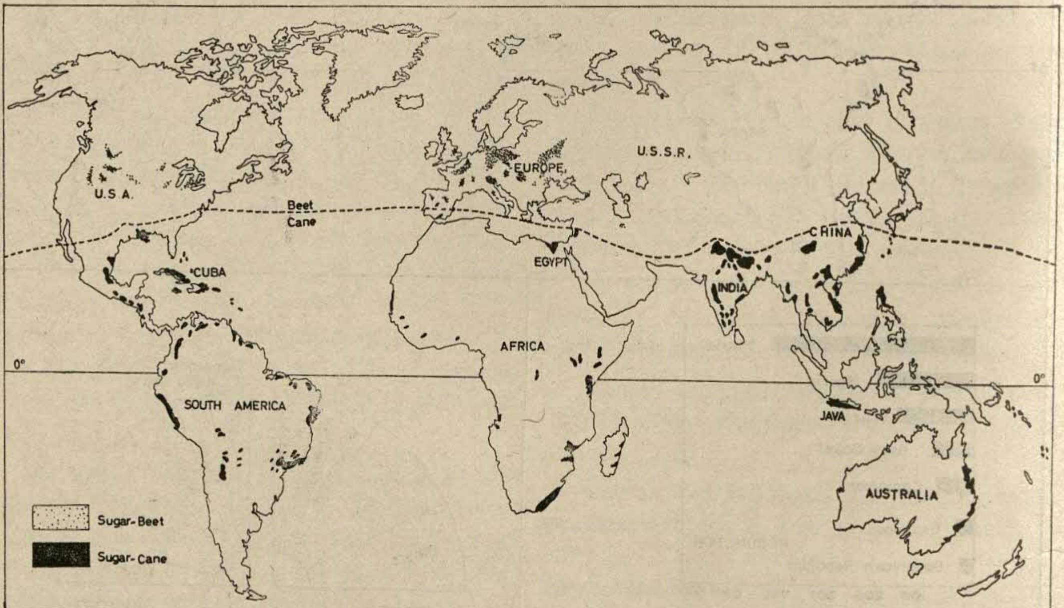

Fig. 20. World Distribution of Sugar-cane and Sugar-beet. (After C.F. Jones and G.G. Darkenwald.)

Sugar-cane is mainly a product of the tropics a savanna climate with heavy rainfall but with a distinct dry or less-rainy season, or of the warm monsoon climatic regions with ample irrigation facilities. The sugar-beet, on the other hand, belongs to temperate regions with rainy summers and dry autumns. How would you account for the absence of sugar-beet in the Southern Hemisphere?

vation with the help of British capital.

India is the largest and perhaps the oldest producer of sugar in the world. Although the word *chini* for sugar, current in Northern India, may suggest a Chinese origin, *sharkara* in Sanskrit appears to be a more convincing basis for its present name *shakkar* or *sakhar* in some parts of India, the name *sucrere* in French, *zucher* in German and *sugar* in English.

Excepting Cuba, India is the largest producer of sugar-cane as well as cane sugar. But most of its sugar is consumed in the country itself. Efforts are being made to export sugar to earn foreign exchange.

The North Indian plains produce most of the sugar-cane and sugar in India; but parts of the Deccan Plateau possess a better climate and soils capable of a higher yield per acre. New sugar mills are coming up in the South, many of which, as in Maharashtra, are in the co-operative sector. The major handicap for growing sugar-cane in the South is the inadequacy of irrigation facilities. Some of the best Indian sugar-cane varieties have been developed at the Coimbatore Research Station. (*See* picture 33.)

Brazil and South American Countries— Brazil stands only next to India in sugar-cane production. The Portuguese were among the first to cultivate sugar-cane in north-eastern coastal lowlands with the help of slave labour. Today, every State in Brazil produces sugar. However, more than half of its output comes from the rolling plateau of East-Central Brazil.

Except Chile, all the South American countries produce sugar-cane. Guyana produces sugar with the help of the immigrant Indians who have settled there in large numbers.

Pakistan stands next to Brazil in the production of sugar-cane.

China like India has been a producer of sugar since ancient times. Its sugar-cane cultivation is confined to South and Central China.

Australia, especially Queensland, is the only tropical country that has taken to sugar-cane farming with the help of white labour. This is the only exception to the general belief that the White man can never be an effective labourer in tropical lands.

Hawaii claims the highest yield of sugar-cane per unit of land. Scientific planting, heavy fertilization, and irrigation are among the important causes of its high yield (Fig. 21).

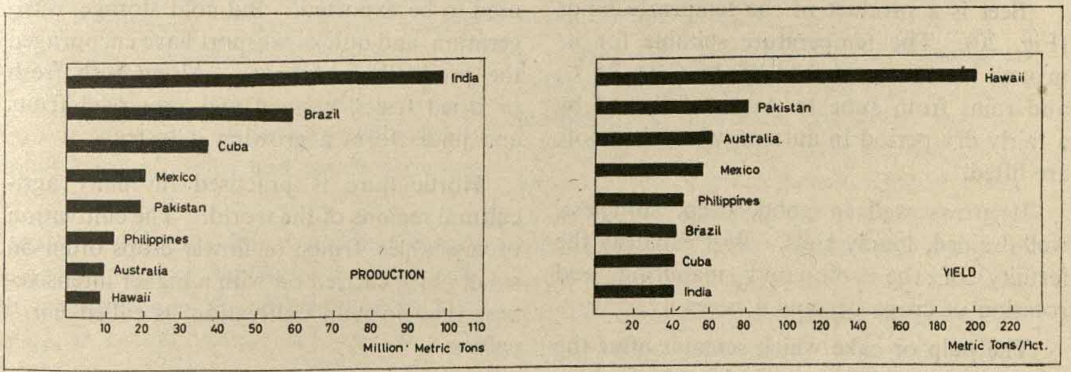

Fig. 21. Production of Sugar-cane and Yield per Hectare (1961-62)

Note the total production and yield of sugar-cane in India, Cuba and Hawaii. What factors are responsible for the high yield in Hawaii?

In the continental United States, Louisiana State in the Mississippi delta is called the "sugar bowl". Mexico is yet another producer of sugar-cane on the North American continent.

In Africa, the important producers of sugar-cane are Natal and Zululand in South Africa, the United Arab Republic, and the Mauritius, and Reunion Islands. Large number of Indians are settled in Mauritius, and they are responsible for introducing sugar-cane farming in the island.

Similarly, the Fiji Islands in the South Pacific grow large quantities of sugar-cane, where also the Indians have settled in large numbers.

Sugar-beet

Sugar from beet was first made in Europe when France could not get cane sugar from its colonies during the period of the Napoleonic wars. Since then, the industry has developed considerably. New varieties of beet having a high sugar content were evolved. The industry suffered during the last two World Wars, but again the production has increased and the demand is easily met. Beet-sugar forms one-third of the total sugar production of the world.

Beet is a product of the temperate lands (Fig. 20). The temperature suitable for its growth in summer should be 15°C to 25°C, and rains from June to August followed by a fairly dry period in autumn when the roots are lifted.

It grows well in good, deep, stoneless, well-drained, loamy soils. Beet exhausts the fertility of the soil, and manuring and rotation of crops become a necessity.

The pulp or cake which remains after the juice is extracted forms good cattle feed or manure.

In the Soviet Union, the important areas of beet production are around Kiev and Kursk in the Ukraine. Although the United States is the second largest producer of beet, its production is only about one-third that of the Soviet Union. Its beet-producing region is the North Central United States. (*See* picture 32.) The other important producers of sugar-beet are the European countries of France, Poland, West Germany, Italy, Czechoslovakia and the United Kingdom (Fig. 22).

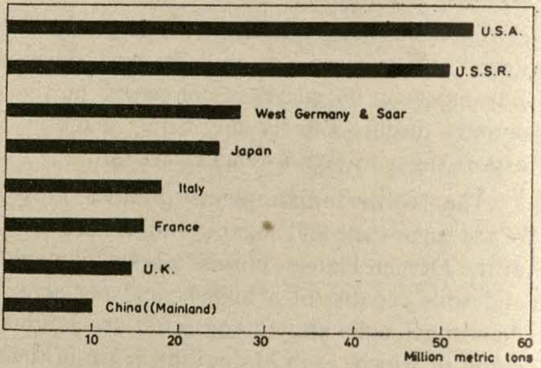

Fig. 22. Production of Sugar-beet (1961-62)

Note the dominant position of the Soviet Union in beet production. What type of climate suits sugar-beet?

Fruits

The production of fruits was only a local occupation for long, and only dried fruits used to be exported. But cold storage, refrigeration, and quick transport have encouraged the production of fruits. Along with fresh or dried fruits, canned and preserved fruits and juices form a growing industry.

Horticulture is practised in many agricultural regions of the world. The cultivation of vegetables, fruits, or flower crops often on small plots, carried on with a higher intensiveness than in field cultivation, is called *horticulture*.

Flower gardening is carried on most intensively for commercial purposes in the Netherlands. This type of horticulture is known as *tulip culture*.

Tropical Fruits—Among the tropical fruits, the mango and the papaiya are very popular. But they are not yet commercially exported. Bananas and pineapples are, however, produced and exported on a large scale.

Banana—The banana needs a hot and moist climate. The Central American countries, Colombia, the West Indies, especially Jamaica, and Costa Rica, grow and export large quantities of bananas to Europe. The Hawaii Islands send large supplies to the United States.

Pineapple—It requires a rich, moist, but light and sandy soil, preferably near the sea. It is exported more as canned fruit than fresh. Hawaii (United States), West Indies, Cuba, the Azores, the Canary Islands, and Malaysia are the important countries exporting pineapples. (*See* picture 35.)

Sub-tropical Fruits—Horticulture is practised on a very large scale in the Mediterranean lands. These lands stand foremost in the production of olives, figs, currants, grapes (for wine), lemons, oranges and almonds. California produces raisins, grapes, and lemons. Grapes and citrus fruits are important in many other areas.

Olive—It is one of the earliest trees cultivated by man. It is a narrow-leafed hardy evergreen tree, noted for its heavy yield of fruit and longevity. Trees more than a century old are common.

It is sensitive to weather during the early growth of the fruit. It grows on hillsides or on stony parts of plains and needs no irrigation.

Spain, Italy, and Greece account for 70 per cent of the world output. The total world production is about 1 million tons of olive oil, in normal years. It is the finest oil and needs no refining.

Figs—This is also a plant mainly of the Mediterranean region, especially of its more hot and dry areas. It grows well on well-drained soils and on hillsides, with a little precipitation. Other crops can be grown between the rows of fig trees. It yields two crops a year.

Fresh figs are consumed in the producing areas themselves but dried figs enter into the world trade.

Turkey is the largest producer; Italy, Greece, and Algeria also export large quantities. It is also an important fruit crop in Australia, South Africa, Chile, and California.

Grapes—There are many varieties of grapes used for different purposes, *viz.*, table use, wine, and raisins. (*See* picture 34.) The production of these varieties and their quality depend on the nature of the soil, the amount and distribution of precipitation and the availability of slopes or valley sites.

Vines grow well without irrigation in the Mediterranean lands, in districts where the annual precipitation is 35 centimetres or more.

European countries account for more than 60 per cent of the world production. France, Italy, Spain, Portugal, Rumania, and Greece are the main producers in Europe. Chile, Argentina, and all the southern European countries except Greece use most of the crop for the manufacture of wine. Greece and California produce chiefly for raisins. (*See* picture 34.) The total world production is about 30 million tons.

Dates—In drier and warmer conditions dates are more important than figs. Tropical temperatures, abundant sunshine, dry air, and irrigation promote date culture in the oases, in the desert regions. They are also grown in warmer and drier sections of the Mediterranean lands. Iran and Iraq are important producers of dates in Asia.

The regions of the Mediterranean type of climate grow varieties of fruit with a high sugar content. Large quantities of these fruits are dried before they enter trade, or they are used directly for the manufacture of wines and brandy.

Fruits of the Temperate Lands

Apples and *pears* are the most important among fruits grown in the temperate zones. The total world output of apples is about 14 million tons. The United States, the United Kingdom, France, Germany, the Low Countries, and Italy are the chief producers. France is the largest producer, with an annual output of about 5 million tons. It is followed by the United States with 2.5 million tons and Germany with about 1 million tons. In Asia, Japan is the largest producer with about 0.43 million tons of annual production.

The *pear* crop of the world is more than 3 million tons. France leads all other countries and is followed by the United States, Germany, and Switzerland. These four countries together account for more than 70 per cent of the world production.

The *peach* crop of the world is about 2 million tons and the United States alone accounts for two thirds of this.

Europe produces 80 per cent of the *cherry* crop of the world. The world output is about a million tons and Germany, Italy and the United States are the chief producers. Most of the European countries grow cherries.

NATURAL FIBRES

Among the important natural fibres are cotton, wool, jute or linen, and silk. Recently several artificial fibres have come into use. Since they have been developed synthetically, they are called *synthetic fibres.*

Cotton

Clothing is one of the primary needs of man and various materials like hides and skins, wool, hair, barks of trees, grasses, cotton, flax, jute, hemp, silk, and rayon are used for the manufacture of clothing. Of all the fibres, cotton is produced in the largest quantity. Cotton clothing is the favourite clothing in most countries of the world.

In India the use of cotton has been known for at least five thousand years as is evident from the threads found in archaelogical excavations in Mohenjodaro.

The cotton-plant during the growing period requires a uniformly high summer temperature of about 25°C. It demands abundant sunshine, and nights as well as days must be warm. It needs rain 50 to 100 centimetres, in frequent showers, well-distributed during the period of its vegetative growth. It also grows well with irrigation water where the rainfall is not adequate. During the period of ripening of the bolls and subsequently in the picking season the weather must be dry, clear, and sunny. Rain or high humidity at this time impairs the crop. Frost ruins the crop and the poleward limit of cotton cultivation can be delimited by the boundary line of 200 days of freedom from frost (Fig. 23).

The cotton-plant needs a rich, light, well drained soil, capable of retaining moisture. This moisture retaining quality of the *regur* or "black cotton soil" of the Deccan Plateau in India makes it highly suitable for the cultivation of cotton.

The cotton-plant grows to a height of a metre, or a metre and a half. It bears fruit or bolls in about six months. The bolls, on ripening, burst open showing the white fluffs around the seeds. The bolls have to be picked immediately after bursting lest the cotton should be ruined by rain, fog, dust, or pests.

The quality of raw cotton depends on the length of the fibre, its fineness, lustre, softness, strength, colour, and cleanliness. The length of the fibre around the seed, which is known as the staple length, varies from 1.25 centimetres to 5.6 centimetres, and cotton is accordingly graded as "long staple", "medium staple" and "short staple" depending upon the length.

There are four varieties of cotton—i) Sea Island, ii) Egyptian, iii) American Upland, and iv) Short Staple Indian variety.

The Sea Island—This variety with a staple length of more than 4 centimetres and often about 6 centimetres is grown in the West Indies and on the coastal lands of Georgia in the United States. It is a fine silky cotton. Some of the best cotton now grown in the Nile Valley in the United Arab Republic and in the State of Arizona in the United States also belong to this grade.

The Egyptian—Most of the Egyptian, Peruvian, Brazilian, East African (that is from Uganda and Tanganyika) and the long staple American cotton rank next. The staple length of this variety is more than 2.8 centimetres.

The American Upland—This cotton with a staple length varying between 2.2 and 2.8 centimetres forms the bulk of the world's cotton production. It is grown in America, Brazil (Sao Paulo), Argentina, parts of Central Asia within the Soviet Union, and parts of China. About one-third of the Indian cotton also belongs to this category.

The Short Staple Indian—The remainder is the American, Chinese, and Indian crop with a staple length less than 2.2 centimetres.

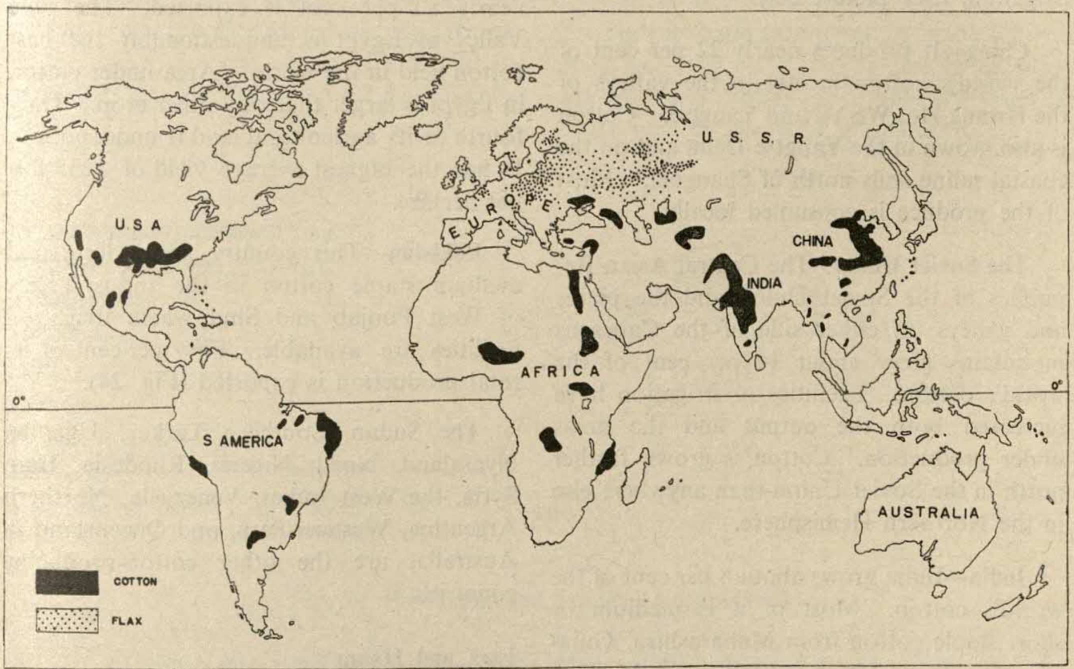

Fig. 23. World Distribution of Cotton and Flax

Cotton belongs to the tropical savanna land, tropical highlands, tropical steppes and hot desert regions where irrigation is available. It also belongs to the lands of humid sub-tropical climate and the somewhat cooler or drier adjacent regions. Flax grows in temperate lands with warm and uniform summer temperatures and high relative humidity. Note the important producers of cotton and flax.

Cotton grown in other Eastern countries also belongs to this category. This short staple cotton is used for the production of coarse cloth.

Principal Areas of Cotton Production

The United States—The United States produce nearly 28 per cent of the world's cotton. The cotton belt of that country stretches from the Atlantic to the Rockies with the limit of 200 frost-free days to the north and the wet rice and sugar-cane belt to the south. It includes parts of Georgia, Alabama, Mississippi, Arkansas, Texas, Arizona, South Carolina, Florida, and Louisiana. Outside this cotton belt, the Imperial Valley in California and parts of Arizona grow cotton under canal irrigation. (*See* picture 38.)

China—It produces nearly 22 per cent of the world's cotton mostly in the valleys of the Hwang Ho, We Yi, and Yangtse. Cotton is also grown in the Yangtse Delta and on the coastal saline soils north of Shanghai. Most of the produce is consumed locally.

The Soviet Union—The Central Asian Republics of the Soviet Union and the plains and valleys on either side of the Caucasus mountains grow about 14 per cent of the world's cotton. Facilities of irrigation have increased both the output and the areas under production. Cotton is grown farther north in the Soviet Union than anywhere else in the Northern Hemisphere.

India—India grows about 8 per cent of the world's cotton. Most of it is medium or short staple cotton from Maharashtra, Gujarat, Rajasthan, Uttar Pradesh, and Madhya Pradesh. Gujarat, Mysore, Madras, and the Punjab produce medium staple (2.8 cm.) cotton. In India, some good varieties like Deviraj, Cambodia, Jarilla, and Karunkanni, are grown. These are well adapted to the local climatic conditions.

Brazil—Now the central plateau of Eastern Brazil produces more than half of the country's cotton crop. The north-eastern part of that country which was the leading cotton-producing area now stands second in importance. In Brazil, especially in the central plateau of the eastern region, cotton-growing is now more popular than coffee.

Mexico—Its major cotton-producing areas are close to the United States border on the Colorado River Delta and along the Rio Grande.

The United Arab Republic—Egypt grows even less than 4 per cent of the world's cotton. But the fertile soil of the Nile Valley, the sunny climate and canal irrigation produce a very high grade cotton of which nearly 80 per cent is exported. The Nile Valley of Egypt is unquestionably the best cotton field in the world. Area under cotton in Egypt is larger than any other crop. One-fourth of its agricultural land is under cotton. It has the highest average yield of 1235 lbs. per hectare.

Pakistan—This country grows long and medium staple cotton in the Indus Valley of West Punjab and Sind where irrigation facilities are available. Fifty per cent of its total production is exported (Fig. 24).

The Sudan, Southern Turkey, Uganda, Nyasaland, North Nigeria, Rhodesia, Iraq, Syria, the West Indies, Venezuela, Northern Argentina, Western Peru, and Queensland in Australia, are the other cotton-producing countries.

Flax and Hemp

Flax is both a grain and a fibre. The fibre is obtained from the stem of the plant. It is produced chiefly in Europe where, as a vegetable fibre, it was very important till America took to cotton cultivation as a commercial crop.

Flax grows well where rye is cultivated. It requires rain during spring and early summer, and is tolerant both of cool weather and a variety of soils (Fig. 23).

After the grain is separated, the stem or straw is retted. Retting is a process of partial decay to make easy the separation of fibres. The separation of fibres is done either by a simple machine or by hand for which cheap labour is necessary.

Flax fibres are strong and durable. Linseed is the seed and linen is the cloth made from the fibre.

Flax is gown in the cool temperate climate of the belt extending from Ireland and North France through Central Europe to Soviet Russia. Belgian flax is of the best quality.

Hemp is really a coarser variety of flax, fit for coarser uses. Hemp is used for the manufacture of ropes, strings, for the lining of carpets and linoleum and for several other things.

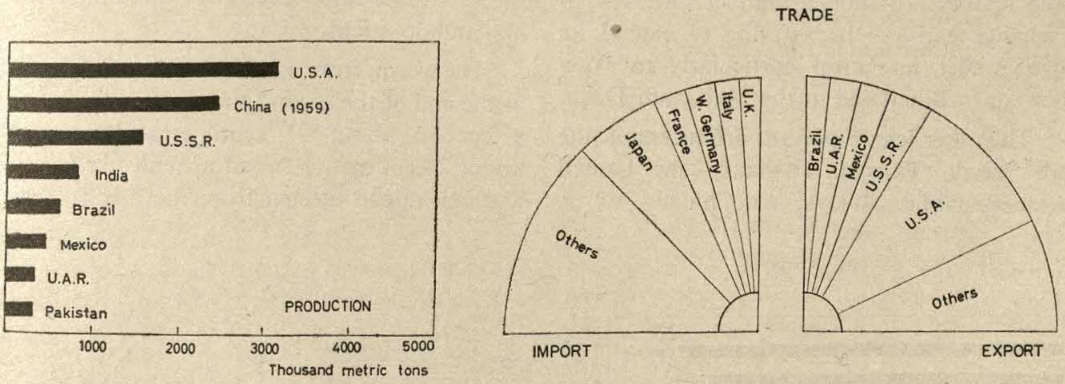

Fig. 24. Production and Trade of Cotton (1961)

The high grade cotton of the United States, Mexico, the United Arab Republic, and Peru is in great demand in many textile manufacturing countries like Japan, India, and the West European countries. Why does India import as well as export cotton?

Genuine varieties of hemp are grown by Soviet Russia, Italy, Yugoslavia, Poland, Korea and other smaller areas. Manila Hemp is a special product of the Phillipines. It is used for rope making. Sisal Hemp of Mexico, Kenya, Tanganyika and the West Indies is not so good as Manila Hemp, but it costs less.

Jute

Jute is called the 'brown paper of wholesale trade' for it is used in packing many commodities like cotton and wool in bales, and wheat, rice, coffee, sugar and cement in sacks. It is the cheapest fibre. It is weaker and less durable than flax or hemp. It can be dyed but not easily bleached.

Jute requires a mean monthly temperature of about 27°C and a high relative humidity between 80 and 90 per cent. It needs a rainfall of 175 to 200 centimetres during the period of its vegetative growth.

The jute plant grows well in friable alluvial soils, rich in salts. The soils of a deltaic plain are specially suitable as they are renewed every year by floods or inundations.

The seeds are sown in March or April and the plants are ready for cutting in August or September when they grow to a height of three metres or more. The method of obtaining the fibre is the same as that for flax or hemp, that is by retting in water.

The delta of the Ganga-Brahmaputra in India and Pakistan produces nearly 95 per cent of the world's produce. New silt, rich in salts, is brought every year by the rivers, and this replenishes the fertility of the soil. Like climate, this is an important factor, because jute exhausts the land very quickly (Fig. 25).

East Pakistan grows most of the quality jute and exports it to India, Scotland, Belgium, France, and Germany, which are fast becoming manufacturers of jute products. Jute makes up about 40 per cent of Pakistan's exports.

India now closely follows Pakistan in the production of jute. The area under jute cultivation has been increased in order to maintain the jute supply to its mills and retain its dominant export position of gunny cloth and bags in the world market. (*See* picture 36.) Jute textiles are India's number one foreign exchange earner. It is trying to extend its areas under jute crop particularly in West Bengal, in Bihar and in the Mahanadi Delta.

The other less important producers of jute are Brazil, Taiwan, Thailand, the United Arab Republic, Malaya, and China.

Silk

The raising of silkworms and the production of raw silk is a special kind of intensive farming known as *sericulture*. It involves the production of a special feed crop and the tending of silkworms, the caterpillars, which are also referred to as the lowliest of the domestic animals. Silkworms are generally raised on farms, or in farm houses and fed on farm-raised mulberry leaves. Raw silk thus produced from the worms becomes the cash crop of the farmer supplementing his farm income. Sericulture demands abundant, cheap, but skilled labour to make it a commerical farming.

The production of silk has been known in China for more than four thousand years. The soft, fine, bright, and light fibre has always been the favourite of all those who can afford it anywhere in the world. The Chinese guarded the trade secret for centuries, and European travellers had to smuggle the silkworms out of China by concealing them in bamboo sticks.

The worm, from which raw silk is obtained, at the end of the second stage in its life makes a cocoon about 2½ centimetres long and about 2 centimetres broad around itself with a sticky thread ejected from the glands near

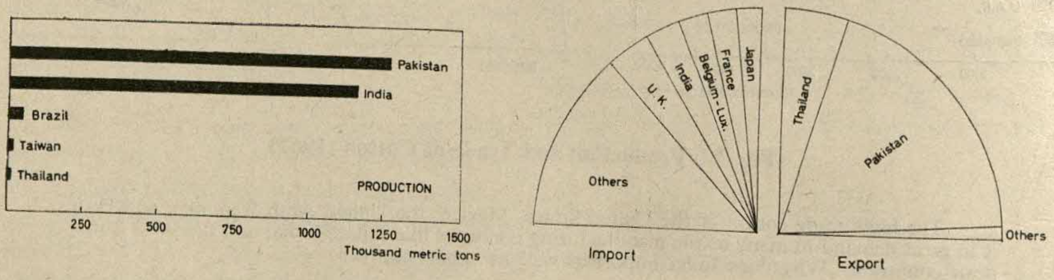

Fig. 25. Production and Trade of Jute (1961)

Pakistan and India monopolize the production of jute. Pakistan produces mostly for the export of raw jute while India for the export of jute textiles. How did the partition of India affect the jute production in the subcontinent?

its mouth. It lies in this cover and undergoes metamorphosis before it comes out as a moth. The cocoons of silkworms are put into boiling water before the moth comes out and the fine thread is separated and wound with great skill. Several threads are made into one thread before the fabric is woven.

Silkworms thrive on white mulberry leaves. They are known to be extremely voracious. A pound of worms consume as much as about 10 tons of leaves a year. (*See* picture 37.) The regions which abound in mulberry trees and in cheap skilled labour alone, can become silk-producing areas.

The mulberry tree needs a temperature of about 13°C for at least three months, but the silkworm cannot live at a temperature below 15°C. So the rooms where the worms are kept are maintained slightly warmer. Cheap skilled labour is more important than climate for the production of silk (Fig. 26).

Principal Silk-producing Areas

Japan—The mountain slopes in Japan, especially in Honshu, which are too steep for producing anything else are used for planting mulberry trees and it ranks first among the silk-producing countries.

China—The valleys of the Yangtse and Si Kiang are important centres of sericulture in China.

The Soviet Union—The chief regions are Central Asia and Trans-Caucasus. The Uzbek Republic produces half of the cocoon crop of the country, which now stands next to China in silk production. The Ukraine, the Crimea, and North Caucasus are the new regions to which sericulture has now penetrated.

India—In India, Assam, West Bengal, Bihar, Madhya Pradesh, Uttar Pradesh, Mysore, and Madras, produce silk from worms which thrive on the leaves of the mulberry or

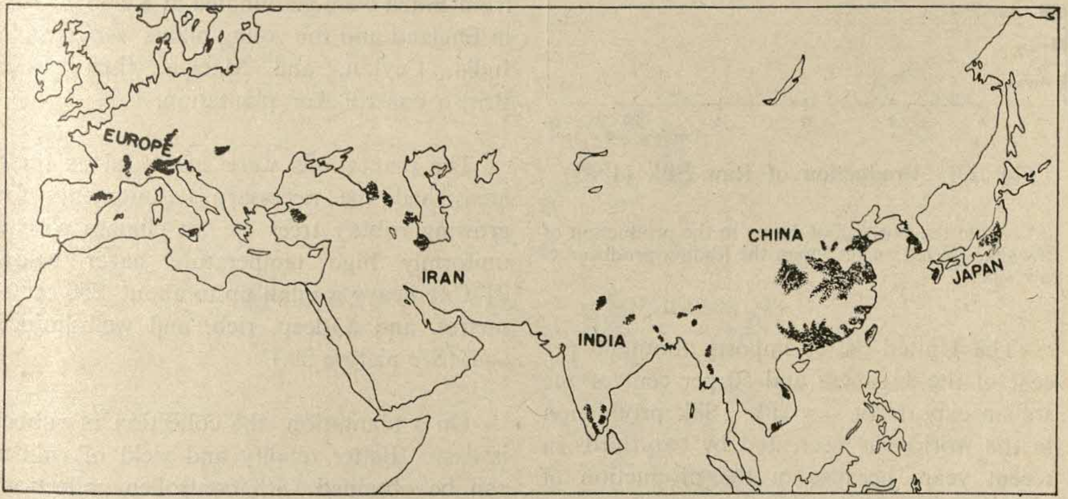

Fig. 26. Distribution of Sericulture (Adapted from C.F. Jones and G.G. Darkenwald.)

The major areas where sericulture is practised are the mountainous districts of Japan (Honshu), in parts of China and Korea, where land is not suited to paddy cultivation. Availability of cheap labour, skilled in work, is the major factor which governs distribution of sericulture. What factors favour sericulture in Southern Europe?

castor plant. Sericulture is being encouraged in South India and other parts.

Italy—The plain of Lombardy in the Po Valley of Italy, produces about 90 per cent of the European produce of silk. Mulberry trees are planted as a support to the grape vines, and wheat is sown in the intermediate strips of land. This is a fine example of intensive farming in a densely populated area.

Korea—The country produces considerable raw silk. The sericulture is widely scattered.

The Rhone Valley in France, south of Lyons, Eastern Spain, and the Western plains of Turkey in Asia are other areas of silk production (Fig. 27).

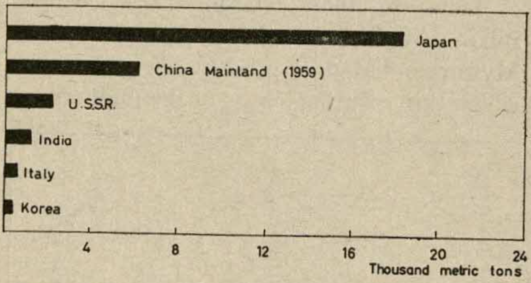

Fig. 27. Production of Raw Silk (1961)

Note the position of Japan in the production of raw silk. What makes Japan the leading producer of raw silk?

The United States imports about 80 per cent of the Japanese and 50 per cent of the Italian exports of raw silk. Silk production in the world has decreased by two-thirds in recent years because of the production of artificial silks like rayon and nylon.

Rubber

Rubber is the sticky juice or latex obtained from a number of trees in equatorial forests. For a long time rubber was used only to erase pencil marks; this is how it got its name. Now, through the process of vulcanization, rubber is made hard by adding sulphur to it. With this hardness and the ability to stand variations of temperature it is being used for a variety of purposes. Since the beginning of the present century rubber has been in great demand for making tyres of bicycles, motor cars and trucks and in the manufacture of electric devices.

Rubber trees were first discovered in the Amazon basin. One of them, the *Para variety*, yields considerable amount of latex. The rubber trees were found greatly scattered in the forest and the people of the region often felled a tree to obtain the juice. This diminished the number of trees. The tedious work of collecting the juice from slanting notches made with a knife into the bark of the tree could not be done by the local people, who were used to easy ways of life. In course of time the Amazon basin could not meet the demand. So in 1876 seeds smuggled from Brazil were germinated at Kew Gardens in England and the young plants were sent to India, Ceylon, and Malaya, then under British control, for plantation.

The plantations were successful as these areas had the necessary requirements for growing rubber trees—a hot climate with a uniformly high temperature never below 21°C, a heavy rainfall up to about 250 centimetres, and a deep, rich, and well-drained soil. (*See* picture 39.)

On a plantation, the collection of rubber is easy. Better quality and yield of rubber can be obtained with controlled collection. Since this needs enormous cheap labour, the local people who worked diligently on the plantations have contributed a good deal to the success of the plantations. (*See* picture 40.) The Dutch also made plantations a success in the East Indies. Adjacent countries also took up the idea and South and South-East

Asia became the main source of *plantation-rubber*, while trade in *wild-rubber* declined greatly (Fig. 28).

About 98 per cent of the world's natural rubber is now grown on plantations in South-East Asia and adjacent islands. Malaysia, Indonesia, Thailand, Ceylon, Viet Nam, Cambodia, and Kerala in India are the producers of rubber in this part. In Africa, Nigeria and Liberia produce some rubber. Brazil in South America produces a little rubber. Till 1910 it had the world monopoly of rubber. But as the rubber plantations in the east succeeded, it was almost thrown out of rubber trade by 1930, making it difficult for it to re-establish its position.

All the industrial nations are the importers of rubber. The United States leads the world in imports buying half of the world produce of natural rubber.

Germany started producing *synthetic rubber* during World War I. Later on, the United States, the United Kingdom, and the Soviet Union also started producing synthetic rubber, when Japan occupied the rubber-producing countries during World War II. Benzine, Coal, Petroleum, Acetone, Methyl-Alcohol, and several carbohydrates are used in the production of synthetic rubber. Synthetic rubber, though cheaper now in the United States than natural rubber, does not have all the properties of natural rubber, and so cannot replace it completely. Synthetic rubber forms nearly half the world's total rubber output and this proportion is likely to increase in future.

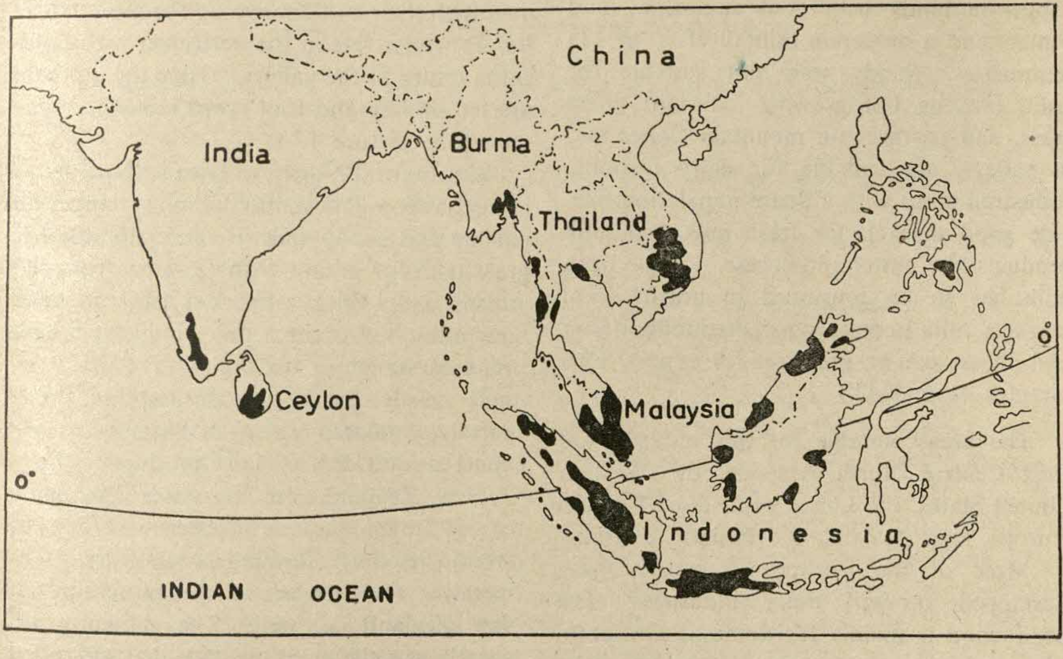

Fig. 28. World Distribution of Natural Rubber (After H.M. Kendall, R.M. Glendinning and C.H. MacFadden.)

South-east Asia produces about 95 per cent of natural rubber. Malaysia, Singapore, and Indonesia together account for over 70 per cent. How would you explain the failure of Brazil and the Congo in rubber production? What are the major destinations of rubber exports?

Dairy Farming

Dairy farming is an advanced type of farming where scientific methods are adopted at every step and there is no rest for the daily routine throughout the year. On bigger farms, hay, root crops, and other forage crops for feeding animals are produced on the dairy farm itself, but some corn and oilseeds like cotton-seed have to be bought. Pigs and chicken are also kept as they feed on skimmed milk, and wastes. They supplement the income of the farmer, who, in addition, usually grows some vegetables, fruits and corn for home consumption. The labour has to be skilled. Modern methods of refrigeration, cold storage, and a number of mechanical appliances have to be used. Co-operatives are formed for various purposes.

Dairy farming is best carried on in the temperate lands with cool summers, mild winters and a moderate rainfall of 50 to 125 centimetres. Sandy soils not suitable for grain farming but growing luxuriant green grass, and pastures on mountain slopes and in valleys, are suitable for dairy farming. Industrial areas with a dense population provide good markets for fresh milk and milk products like butter and cheese. While fresh milk has to be consumed in nearby local markets, milk powder, condensed milk, butter and cheese can be produced for export. (*See* pictures 41 and 42.)

The areas suitable for this industry are East Central North America, the Western United States, the Low Countries of Western Europe, New Zealand, and Eastern Australia.

Most of the European countries have developed modern dairy industries. The production is mainly for domestic consumption and in some cases for export. The industry is highly developed, particularly in Denmark and in the Netherlands. Ireland also exports dairy products to Britain. Government encouragement for dairying, development of co-operatives, promotion of scientific methods, quality control by the governments and the proximity to urban markets of the Western Europe have helped the growth of dairy farming, including poultry. (*See* picture 44.)

France, the United Kingdom, Germany, the Soviet Union, and Italy also now practise dairy farming, but these cannot produce sufficient quantity for domestic consumption. Most of the best breeds of dairy cattle like the Jersey, Guernsey, Ayrshire, Holstein, and Brown Swiss have been supplied to the world by the dairy farms of Europe. (*See* picture 21).

The Swiss dairy products rank among the best in the world. The mountain pastures yield rich luxuriant grass. The mountain pastures are inaccessible in winter. Transhumance, therefore, is a characteristic feature of Swiss dairy farming. In spring, the herdsmen with their cattle move up the mountains. Before winter sets in the herdsmen with their cattle return to the valleys. Here the animals are fed on hay and root crops raised in summer. (*See* picture 17.)

East Central North America with its dense industrial population, its cool moist temperate climate and sandy soils is more suitable for grass than for grain. Ample water from the streams and a thick network of efficient roads and railways support a dairy industry which produces immense quantities of dairy products mostly for home consumption. The sparsely populated regions of Eastern Canada export a good deal of dairy products.

New Zealand also possesses the same natural advantages as Western Europe to develop its dairy farming successfully. Co-operative societies are a special feature in New Zealand as well. The difficulty till recently was the great distance that separated New Zealand from the European market; it has now been overcome by the provision of refrigeration on ships.

South East Australia also has a well-developed dairy farming but the exports of butter suffer from fluctuations owing to frequent droughts (Fig. 29).

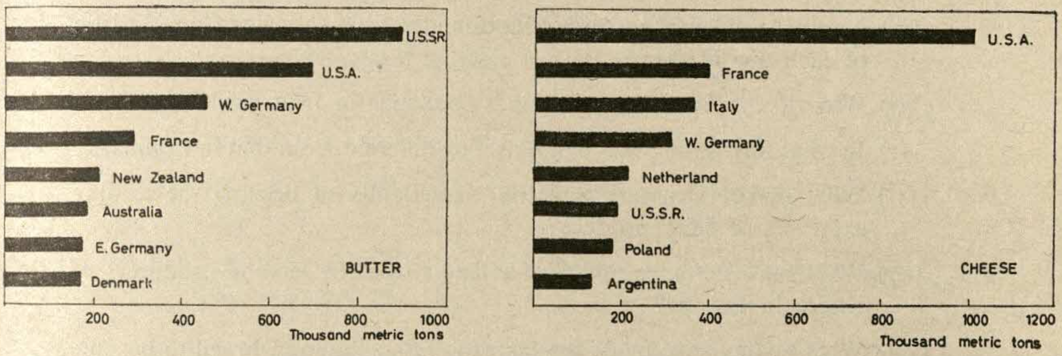

Fig. 29. Production of Butter and Cheese (1961)

Note the countries which lead in butter and cheese production. Find out how much milk is required to produce a pound of butter or cheese.

Dairy farming in India is still unorganized. Its milk output estimated to be nearly 21 million tons in 1961 is very low as compared to its number of cattle. Out of 176 million cattle in India, about one-third are milch animals including cows and buffaloes. India has some fine breeds of cattle, like the Sindhi, Sahiwal and Gir, but all the same, the annual yield of milk per cow is only 188 kilogrammes and per milching buffalo it is 500 kilogrammes. India's yield of milk per cow is perhaps the lowest on record. In the Netherlands, the average annual milk yield per cow is more than 4,200 kilogrammes. (*See* Appendix V.)

Extensive pasturelands in India have been converted into crop lands and cattle do not get green grass all the year round. Hay or dry fodder is not nutritious and so cattle do not produce milk in abundance.

The Central and State Governments are encouraging modern dairies. Modern dairies have been set up in places like Bombay, Delhi, Poona, Kudgi, Kurnool, Guntur, Kodaikanal, and Haringhata. (*See* picture 43.) The Anand milk scheme provides large quantities of milk and milk products to Bombay. Uttar Pradesh, Rajasthan, Madhya Pradesh, and the Punjab are notable producers of *ghee*. *Ghee* or clarified butter, is used more extensively than butter in India. It is also exported to Malaya, South Africa, Ceylon, Mauritius and Hongkong. Nepal exports *ghee* to India.

Farmers in India use cattle as draught animals for work in the fields and for drawing carts. They generally keep a few cows or buffaloes for their domestic supply of milk, but many of them have begun supplying milk and milk products to the growing industrial and urban centres. This activity can be organised on a co-operative basis. Good breeds of milk animals, technical knowledge of modern scientific methods and facilities for transport and refrigeration will improve dairying in India.

EXERCISES

Review Questions

1. Answer the following questions :

   (*i*) In what ways (two) is the production of natural raw silk related to agriculture?

   (*ii*) How does tea plantation in India differ from that in China?

   (*iii*) Name the different varieties of cotton, describing a major characteristic of each one of them.

   (*iv*) Why do the Mediterranean lands specialize in fruit gardening?

   (*v*) In what way is the Swiss dairy farming different from that in Denmark?

   (*vi*) What makes Denmark and the Netherlands to become the leading exporters of dairy produce?

   (*vii*) What makes France and Switzerland to be the leading producers of cheese in Europe?

   (*viii*) What factors have made the Plateau of Sao Paulo in Brazil to become the largest producer of coffee in the world?

   (*ix*) Why is jute called the brownpaper of wholesale trade?

   (*x*) What is horticulture? How does it differ from ordinary agriculture?

   (*xi*) Explain sericulture and name the leading countries where it is widely practised.

2. Compare and contrast :

   (*i*) Life in a tea garden in Assam and one in a Brazilian Fazenda.

   (*ii*) A rubber plantation in Malaysia and collection of natural rubber in the Amazon Valley.

   (*iii*) Dairying in New Zealand and mixed farming in the United Kingdom.

3. Narrate briefly the life story of a tea packet from Assam being sold in the London tea market. Describe vividly the natural habitat of a tea-plant, the various activities at the tea garden, the processes which the tea leaves have to undergo in a tea factory and the way tea is transported and marketed.

4. Compare and contrast beet and cane as the two sources of sugar and outline the natural conditions under which they are grown.

5. Discuss systematically the climatic and other conditions required for growing cotton. Compare the conditions found in the cotton belt of the United States, the Nile Valley of Egypt and in the cotton-growing parts of India.

6. Given below in the first column are certain conditions of growth that are most appropriate to only one of the four crops mentioned in the other column against each of the statements. Tick mark the right crop for each of the following statements :

(*i*) Alluvial soils which are renewed every year by the deposition of silt.	(Rice, jute, maize and rubber)
(*ii*) Cheap and abundant supply of co-operative labour.	(Rice, silk, cotton and tea)
(*iii*) Heavy rainfall of about 250 centimetres throughout the year.	(Rubber, tea, sugar-cane and jute)
(*iv*) Higher slopes of the tropical highlands.	(Cocoa, maize, rubber and coffee)
(*v*) Humid lowlands of the tropical regions.	(Cocoa, tea, cinchona and coffee)
(*vi*) Hill sides and stony plains without any irrigational facilities.	(Figs, dates, apple and olives)

7. Listed below are the conditions for growth of coffee, rubber, sugar-cane, and jute. Read them carefully and group them under respective heads to complete the table. The table in respect of tea may serve you as an example :

(*i*) A high mean monthly temperature of 27°C during the growing season.

(*ii*) Rainfall of about 100 to 175 cm. with a distinct dry spell and sunny weather at the end of a long growing season.

(*iii*) Level lowlands in the tropics.

(*iv*) Rainfall 100 to 175 cm. during spring and summer.

(*v*) Much labour, prepared to work in hip-deep water.

(*vi*) The deep, rich well-drained soils.

(*vii*) A heavy rainfall of about 250 cm.

(*viii*) Rich well-drained soils preferably of igneous origin.

(*ix*) An average temperature of 18° C. to 25° C.

(*x*) Heavy, well-drained soils with a high water-holding capacity.

(*xi*) Friable alluvial soils rich in salts easily renewable every year.

(*xii*) Higher slopes of tropical highlands.

(*xiii*) A good deal of local manual labour.

(*xiv*) Low coastal plains and rolling lands in the equatorial region.

(*xv*) Uniformly high temperatures of about 21°C throughout the year.

(*xvi*) A heavy rainfall of about 175 to 200 cm. during the growing seasons, that is, in spring and summer.

(*xvii*) Ample cheap labour during the picking season and in the earlier years of plantations.

(*xviii*) A high temperature of about 28° C.

(*xix*) Flood plains and deltaic regions.

(*xx*) Cheap and diligent local labour.

Crop	*Temperature*	*Rainfall*	*Soil*	*Terrain*	*Labour*
Tea	Average summer temperature of 25° C.	200 cm. in frequent showers throughout the year.	Deep, well drained fertile soil with a little iron content.	Along the hill slopes and well-drained valleys.	Enormous cheap labour, deft at plucking tea leaves.
Coffee					
Rubber					
Sugar-cane					
Jute					

Finding Out

(*i*) Find out the current trends in world trade of tea with special reference to India's position.

(*ii*) Collect data regarding the production of jute in India since the Partition and review the progress made by India so far. Do you think that India and Pakistan should collaborate rather than compete with each other in the production of raw jute and jute textiles? Give reasons in support of your contention.

Cartographic Work

1. Prepare the appropriate temperature and rainfall graphs for the following crops :

   (*i*) Tea; (*ii*) Rubber; (*iii*) Sugar-cane; (*iv*) Coffee; (*v*) Rice; (*vi*) Sugar-beet; (*vii*) Cotton; and (*viii*) Jute.

   For your guidance suggested below are the places, the climate of one of which is suitable for one of the crops mentioned above :

   (*i*) Kandy; (*ii*) Dacca; (*iii*) Dallas; (*iv*) Kiev; (*v*) Kuala Lumpur; (*vi*) Honolulu; (*vii*) Rangoon; and (*viii*) Sao Paulo.

2. Collect climatic data of monthly rainfall and temperature from some geography book or atlas and draw the graphs. Also see the relevant appendix. Compare these graphs with one another. (N.B. It can be a suitable group activity for the class.)

Picture Reading

Study carefully the pictures referred to in this chapter and write a note on the special type of labour employed on different farms such as a tea-garden, a coffee fazenda, a sugar-beet farm, a sugar-cane plantation, a vine-yard, a cotton field, a rubber estate, a poultry farm and a place where sericulture is practised.

Films Available

i. The Cup that Cheers. No. 633.7; 11 mins; Hindi/English; D.A.V.E.

ii. How to Grow More Sugar-cane. 20 mins; Hindi; U.S.I.S.

iii. Apples——From Seedling to Market. No. 634.1; 11 mins; English; D.A.V.E.

iv. Cotton. No. 677.2; 11 mins; English; D.A.V.E.

v. This Is Rubber. No. 678.2; 15 mins; English; D.A.V.E.
Also No. 153, of Malaysian High Commission.

vi. Rubber From Malaya. No. 678.2; 10 mins; English; D.A.V.E.
Also No. 118, Malaysian High Commission.

vii. Poultry——A Billion Dollar Industry. 28 mins; English; U.S.I.S.

viii. Milk for the Millions. No. 637.1; 11 mins; Hindi; D.A.V.E.

ix. Our Milk Co-operative. 17 mins; English/Hindi; U.S.I.S.

x. Milk Made. 27 mins; English; C.H.C.

Further Readings

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CHAPTER 6

Mineral and Power Resources

BESIDES using the materials obtained from plants and animals, man uses also the minerals that are derived directly from the earth's crust. The earth's mineral resources have been used to a certain extent since pre-historic times. For example, primitive man occupied rock caves for shelter and shaped rocks for axes and hammers, however crude they might have been. He searched for native copper and gold and meteoric iron. What charmed him most was perhaps their lustre. He quarried stone and used clay for pottery. He has been using rocks like basalt, granite, sandstone, limestone, slate, marble, and clay for building purposes.

The search for precious minerals took man to the remote parts of the earth. In fact, it was one of the strongest forces motivating world exploration. During the last hundred years or so, great strides have been made in the discovery, extraction, and utilization of mineral resources.

Rocks are composed of one or more minerals. The proportion of a mineral in a given rock may vary considerably.

Minerals on the other hand, possess a definite chemical composition comprising one or more elements and can be identified by their physical and chemical properties.

Mineral ores are the metals in their raw state as extracted from the earth. A mineral ore may or may not be commercially exploitable.

Barring a few exceptions, *metals* are elements that possess a typical lustre. They are generally heavy and solid. They are often hard and can be melted, drawn into wire, or rolled into thin sheets.

Minerals are of *two* kinds—*metallic* and *non-metallic*. For example, an ingot of iron, a padlock of brass, and a mighty railway engine are the products of metallic minerals, whereas clay, sulphur, coal, petroleum, and salt are classified as non-metallic minerals. Whereas the metallic minerals are generally associated with igneous and certain highly metamorphosed rocks, the non-metallic minerals are found in sedimentary rocks.

Coal and petroleum are the two very important non-metallic minerals of our machine age. They provide power for transport and industry, and are called *mineral fuels*.

The open-air excavation in the earth's crust from which stone or building rocks are obtained by cutting, blasting, etc., is called a *quarry*. Some of the minerals are found on the surface of the earth, while others have to be obtained from *mines* dug deep into the bowels of the earth.

Mines are of *two* types—*open-pit mines* and *shaft mines*. *An open-pit mine* resembles a quarry except that it is usually on a very big scale. *A shaft mine* is dug deep into the earth. Some of them are about three kilometres deep. The Kolar gold mines in Mysore, more than two and a half kilometres deep, are among the deepest mines in the world. (*See* pictures 45, 46 and 49.)

IRON

Although iron makes up about 5 per cent of the earth's outer crust, the iron-ores that can be commercially exploited are found concentrated in a few patches in the earth's crust.

Man has been using iron for centuries but during the last hundred years or so, he has used it in enormous quantities for a variety of purposes. Iron can be produced at less than a fifth of the cost of any other metal, and about seven times as much iron is being used as all the other metals put together.

Besides its abundance and low cost of production, the increasing consumption of iron is explained by the fact that it can be hammered, rolled, cast, drawn into wire, welded or combined with many other metals and it can be hardened to a considerable extent.

The production of iron and steel is, in fact, an index of a country's industrial growth and its defence potential. The *per-capita* consumption of iron and steel in a country gives a fairly good idea of its standard of living. (*See* Appendix VIII.)

There are three principal groups of iron-ores. These iron-compounds are *Haematite, Magnetite* and *Limonite*. Haematite is the most important ore since its known deposits are very extensive. Haematite, Magnetite and Limonite are all iron oxides. The chemical composition and the theoretical percentage of metallic iron contents in them are :

Type of Iron-ore	*Chemical formula**	*Approximate percentage of metallic iron*
i) Haematite	Fe_2O_3	70.00
ii) Magnetite	Fe_3O_4	72.4
iii) Limonite	$2Fe_2O_3 3H_2O$	59.89

Since these iron-ores are always found mixed with some impurities, they actually do not yield as much metallic iron as is suggested by the figures given above. Limonite is a hydrated iron oxide with an iron content usually less than 40 to 50 per cent. Laterite also contains iron although its proportion is not very high.

Iron-ore is mined either by the *open-pit method* or by the *shaft* and *tunnel method* depending on the nature of the occurrence and the depth of the ores.

Iron-ore is smelted in a blast furnace by heating it with limestone and coke to obtain *pig iron*. It can be used as *cast iron*. By removing the carbon in pig iron, it can be used as *wrought iron* and can be rolled or hammered.

Different metals like manganese, nickel, vanadium, chromium, and tungsten are mixed in various proportions with iron. Then by tempering it at different temperatures, a variety of steels having different properties can be produced, for example manganiferous steel, chromium steel, etc.

Principal Areas Producing Iron-ore

The Soviet Union—The iron deposits of the Soviet Union are widely scattered in

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*Fe—Iron, H—Hydrogen, O—Oxygen, C—Carbon.

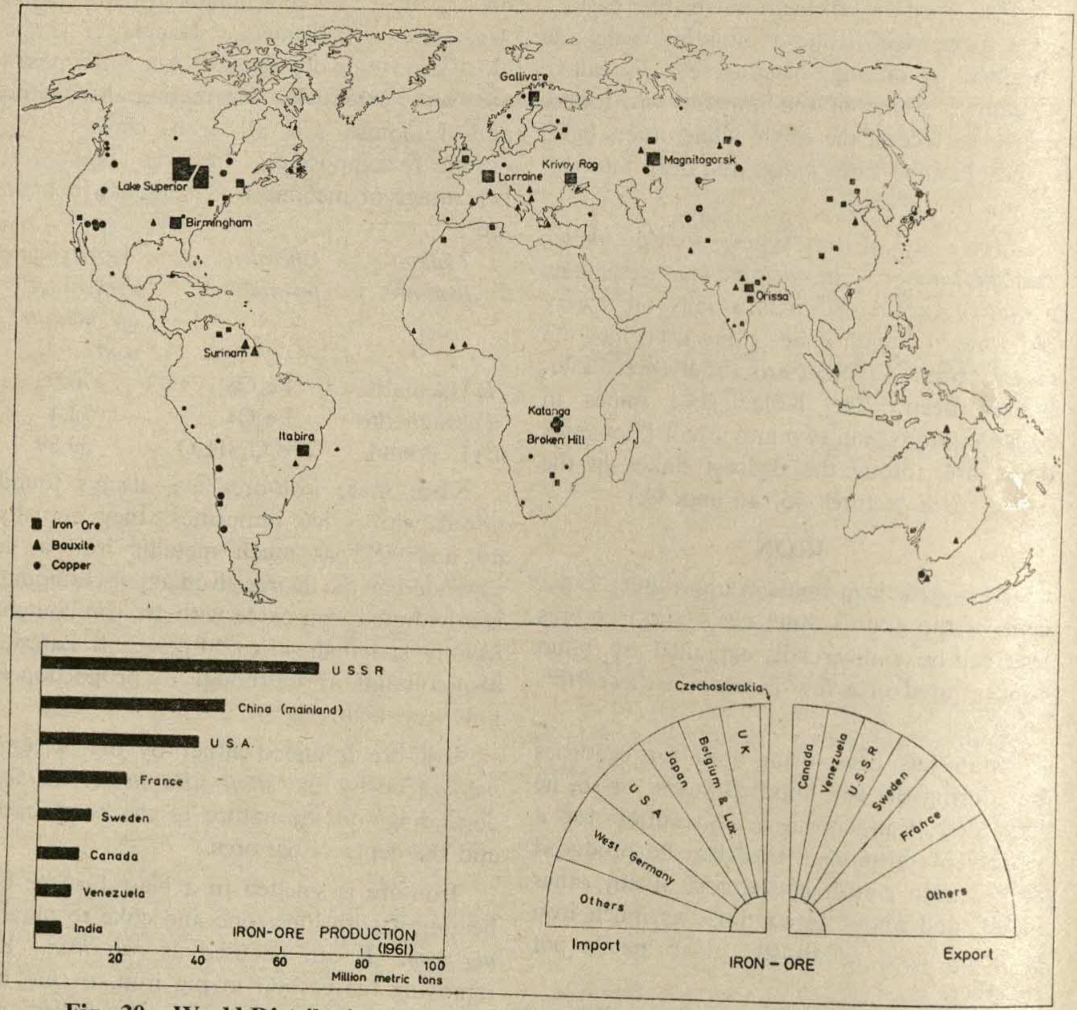


Fig. 30. World Distribution of Iron-ore, Bauxite and Copper-ore (Adapted from F. Debenham.)

The Soviet Union, China and the United States together account for about 56 per cent of the world output of iron-ore. Note the position of leading importers of iron-ore, *viz.*, Germany, the United States, Japan, Belgium, and the United Kingdom on the coal map of the world. Where does India stand in respect of iron and coal production?

different parts of its territory. Most of them are located far away from the coal-fields. Long distances over which the ore is to be hauled by the railways are a handicap in the economic development of these ore deposits. Nevertheless, the Soviet Union today stands first in the production of iron-ore.

The ore deposits with 45-55 per cent of iron content are found in the old iron fields in Krivoy Rog in the Donetz Coal Basin in South Ukraine. The deposits in the Mount Magnitnaya District in the Urals have been recently developed. This area supplies ore to the great iron and steel centre of Magnetigorsk. Kursk Magnetic Anomaly also contains large deposits. Tula District near Moscow in Central Russia is yet another iron mining region.

The other iron-ore deposits are in Yensk, in the Caucasus in Armenia, in Azerbaidzhan in Central Kazakhastan, in the region south of Kuzbas, and in the East Siberian Plateau (Fig. 30).

China—It has iron deposits in Manchuria, Lower Yangtze Valley between Tayeh and Nanking, and in Kwantung. The Manchurian reserves are fairly large and are located south of Mukden. These deposits, although rather low in iron content are favourably placed for development. They are found in thick beds and are worked by the open-pit method. They are located near the coal-fields and are close to the Manchurian Railway.

The Shantung Peninsula has ores with a high iron content. They lie near Shantung Railway and are fairly close to the Poshan coal-fields.

The Chinese production of iron-ore in the recent years has surpassed that of the United States and France.

The United States—For a long time, the United States had been the leading producer of iron-ore. In 1957, its production of iron-ore was 57 million tons. In recent years, however, it has become the third largest producer of iron-ore, with an annual output of nearly 40 million tons. It supplements its own requirements by importing ore from Chile, Venezuela, Brazil, Sweden, Spain and the former French African territory of Guinea.

The Lake Superior region along with the Mesabi and associated ranges, produces most of the iron-ore. It is sent to the Michigan lakeside towns, south and north of Chicago including Gary. It is also sent to the Erie lakeside towns east and west of Cleveland and from that by rail to the Pennsylvanian coal-field around Pittsburgh. (*See* picture 45.)

Yet another important centre of iron-ore production is near Birmingham in the South Appalachian region of Alabama State.

France—The Lorraine Basin is considered to be the largest iron reserve in Europe. It accounts for more than half the ore mined in Europe. The ore is rather low grade with a high percentage of phosphorus. Major iron plants are located between Nancy and the Luxembourg border. The iron and steel plants in the Ruhr region of West Germany are also supplied with ore from France.

Sweden—The Gallivare area in the north and the Kopparberg area in the south produce excellent magnetite-ores. But Sweden has no coal to smelt them. Most of the ore has, therefore, to be exported. The siderite deposits of iron-ore gave Sweden a high reputation in the manufacture of sharp-edged instruments including cutlery.

Canada—The so-called Canadian shield which extends into the United States in the Lake Superior area is rich in iron-ore. Labrador and Northern Quebec have huge deposits. These mines sustain the iron and steel industry around Lake Ontario.

Venezuela—Its large deposits of high-grade iron-ore are in the Guiana Highlands. The two important mining areas are El Pao and Cerro Bolivar. The ore is exported to the United States.

India—The Singhbhum (Bihar), Keonjhar, Bonai, and Mayurbhanj (all the three in Orissa) are the major producers of iron-ore. The Kemmangundi field in Mysore is the next largest producer.

The Lohara and Pipalgaon fields in Chanda District and Redi field in Ratnagiri District in Maharashtra, the Bailadila, Dalli, Rajhara and Bastar fields in Madhya Pradesh, Salem and Tiruchirapalli fields in Madras, Hyderabad field in Andhra Pradesh and fields in Goa and some other parts have either begun production or will start producing in the near future.

India possesses perhaps one of the largest iron-ore deposits in the world, about one-fourth of the world resources; but it is not so fortunate in coal reserves, especially the high quality cokable coal necessary for smelting iron. Therefore, India has to export, some of its iron-ore. The main importers of Indian iron-ore are Japan, Poland, Yugoslavia, Hungary, Italy, and East Germany.

Brazil—This country is credited with the largest reserve of high-grade iron-ore in South America and one of the largest in the world. The deposits are located at Itabira in the State of Minas Geraes. Ore is shipped south by rail and water to the coal-fields of Volta Redonda. Brazil exports its iron-ore to the United States in fairly large quantities.

The other less important producers of iron-ore are Great Britain, Germany, Belgium, Luxembourg, Spain, Australia and South Africa.

MANGANESE

Manganese is essential to the production of quality steel. It helps to remove oxides formed while melting iron. On an average about fourteen pounds of manganese is used for every ton of steel made. Nearly 90 per cent of the world's manganese is used for this purpose. The rest of it is used in the

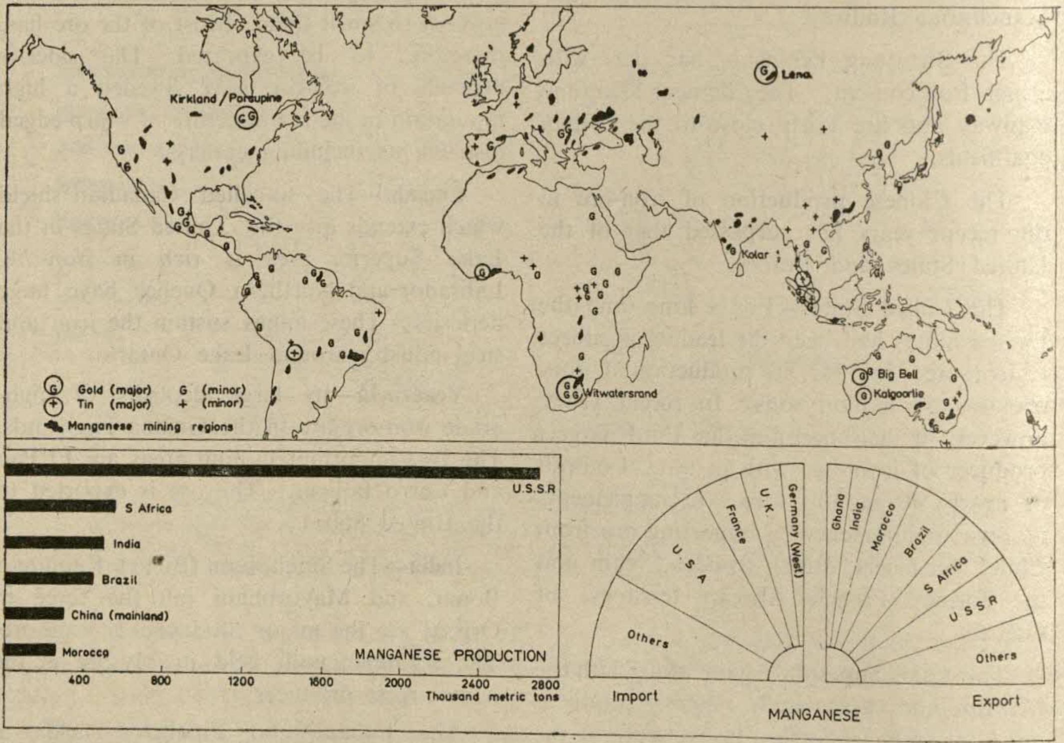


Fig. 31. World Distribution of Manganese-ore, Tin and Gold

The Soviet deposits of manganese-ore in the Caucasus region and the Donetz Basin alone account for one-third of the world production. South Africa, India, and Brazil are the other major producers of the ore. Note the importers of manganese-ore. What do they signify?

manufacture of enamel, dry batteries, glazed pottery, plastics, chemicals, varnish, glass, and disinfectants.

The Soviet Union is the largest producer of Manganese. The deposits occur in the Donetz Basin, Trans-Caucasia, Lake Baikal and the Amur Basin. South Africa follows the Soviet Union in manganese production.

Although **India** ranks third in the production of manganese ore, it is estimated that it has the largest reserves in the world. The Balaghat, Chindwara, and Jabalpur districts of Madhya Pradesh produce nearly 55 per cent of the country's output. Orissa has mines in Gangapur, Keonjhar, Bonai, and Ganjam Districts. The Nagpur and Bhandara Districts of Maharashtra possess some of the important deposits. The Chitaldurg, Kadur, Shimoga and Tumkur Districts of Mysore, Kalhan and Singbhum Districts in Bihar, and Goa also produce manganese. Much of this ore is exported to the United States, the United Kingdom, Japan, France and Germany.

Brazil now closely follows India in manganese production. China, Morocco, Ghana, Congo, and Japan are the other producers of manganese.

BAUXITE

Bauxite is mined for the aluminium it contains. Aluminium possesses high industrial value because of its lightness, strength, electrical conductivity and resistance to corrosion. It is, therefore, in great demand. Its alloys are used in aircraft factories for their strength and light weight. Aluminium is also used in various industries like transportation, electric appliances, foundries, chemical industries, machine building, and cooking utensils.

Although about 3 per cent of the earth's crust is aluminium, and clay is a silicate of aluminium, the metal can be obtained commercially only from bauxite which contains hydrated aluminium oxides.

Theoretically bauxite contains 39.13 per cent of aluminium. The ores, however, actually yield 30 to 35 per cent or even less of metal. The extraction of the metal from the ore requires cheap and abundant supply of electricity, and hence the production is carried out only where abundant electrical energy is available at a low price (Fig. 32).

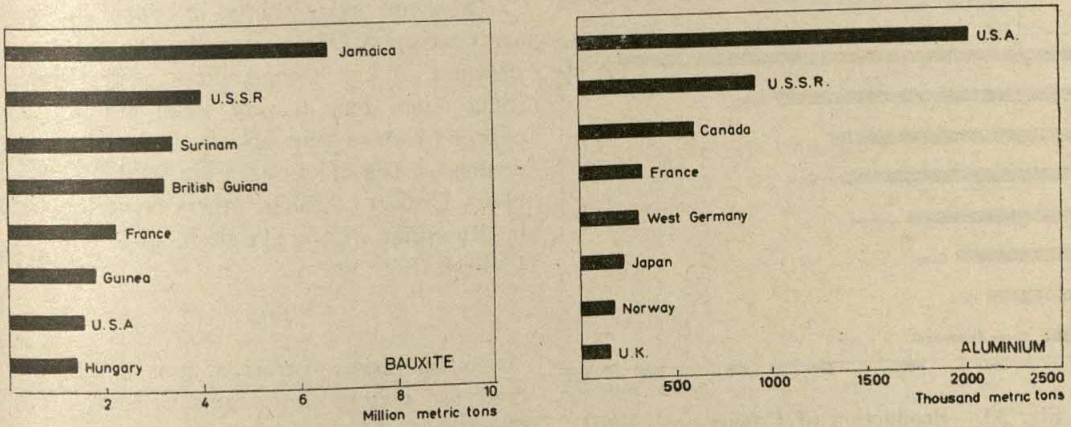


Fig. 32. Production of Bauxite and Aluminium (1961)

The bulk of the world's bauxite reserves is located in the tropics. It is believed that the bauxite is derived from aluminous rocks as a result of intense weathering in hot humid climates and the leaching out of soluble earth materials owing to heavy rains. One ton of aluminium is obtained from four to six tons of bauxite ore. Why are cheap electricity and transport essential for the production of aluminium?

Jamaica, the Soviet Union, Surinam, British Guiana, France, Guinea, the United States, Hungary, Ghana, China and India have large reserves of bauxite (Fig. 30).

Surinam and Indonesia supply bauxite to the United States, British Guiana to Canada and France, and Ghana to the United Kingdom. Scrap aluminium is also used as a source of aluminium.

Bauxite is mined in **India** in Madhya Pradesh, Gujarat, Maharashtra, Bihar, Orissa, Madras, and Kashmir. Most of it is exported. However, aluminium is now manufactured in three centres—J. K. Nagar, Alwaye, and near Rihand. A couple of new plants are also about to be set up very shortly. With increased supply of hydro-electricity, India will be able to produce more aluminium in the near future.

COPPER

Besides being used for household utensils and wires, copper is mainly used to form important alloys by mixing it with other metals. Bronze, brass, and German silver are some of these alloys. Copper is a very good conductor of electricity, next only to silver. Its ductility and resistance to rusting are useful properties. Therefore, the greatest use of copper at present is being made in manufacturing electrical cables.

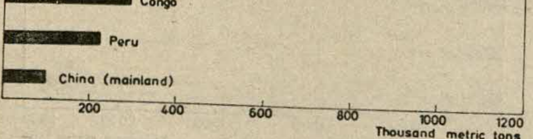


Fig. 33. Production of Copper-ore (1961)

The bulk of the copper-ore deposits is concentrated in a few countries, *viz.*, the United States, Chile, Zambia, the Soviet Union, and the Congo. Why do a large number of industrialized countries import copper?

Copper occurs as pyrites which have a very low metal content—only about 2 per cent. It generally occurs in combination with iron, silver, gold, lead, and sulphur. The ore has to be extracted near the mines to avoid high cost of transportation.

In the **United States**, copper is mined chiefly in the States of Michigan, Utah, Nevada, Montana, and Arizona (Fig. 33).

The western slopes of the Andes in the desert parts of Chile have large reserves and produce large quantities of copper. The opening of the Panama Canal and capital from the United States, helped copper-mining in Chile.

There is an important area of copper-mining in the interior of southern Africa extending on both sides of the Congo-Rhodesia boundary. It produces copper in large quantities. Its ores contain more than 6 per cent of metallic copper. **Zambia** stands next to the United States in copper production.

Other important regions of copper mining are the Soviet Union, Canada, the Katanga province of the Congo, Peru, and China. India mines only a very small amount of copper which supplies about a fifth of its own demand. The chief mines are in the Singhbhum District of Bihar, others being located in Rajasthan, Uttar Pradesh, and Andhra Pradesh (Fig. 30).

TIN

As tin resists corrosion, it is commonly used for plating thin sheets of steel. Tin plate is used to make containers or cans for various products such as processed food, kerosene, and cigarettes. Tin is also used in alloys like bronze and type metal and also for galvanizing and soldering. Nearly half the tin production in the world is used for making tin plates which contain only 1.5 per cent of tin by weight.

Tin occurs in the form of an oxide in metamorphic rocks. The ore occurs in veins inside the rock as *tin-lode*. In South-East Asia, however, and especially in Malaya, the rivers have eroded the lodes and deposited them in the form of gravels. These gravels are dredged, and the metal content is concentrated in a concentrating plant. Then it is smelted into pure metal. (*See* picture 47.)

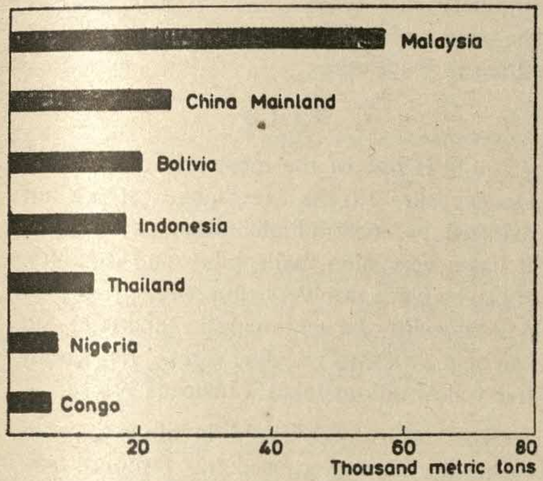


Fig. 34. Production of Tin-ore (1961)

Malaysia has produced more tin than any other country and it is expected to hold its premier position for a long time to come. The bulk of its tin-ore is derived from alluvial deposits by the use of dredges and gravel pumps. What is the difference between tin-lode and tin-gravels?

Malayasia, China, Bolivia, Indonesia, Thailand, Nigeria, and the Congo are the chief tin-producing areas (Figs. 31 and 34). About two-fifths of the world's tin is smelted in South-East Asia and the remainder in the United States, the United Kingdom, and the Netherlands.

Malaysia ranks first in the production of tin-ore. In 1961, it alone produced about 35 per cent of tin-ore and half of the world's tin. China has its tin mines in Yunan and Kwangsi. Tin mines in Bolivia are situated in the Andes at high altitudes away from the coast, and yet the export of the metal constitutes the chief source of revenue. Indonesia and Thailand are the two other major, producers of tin-ore in South-East Asia. Nigeria and the Congo are the major tin-producing countries from Africa.

Burma, the Soviet Union and the United Kingdom have a few tin mines. The Cornwall tin mines in Britain are now practically exhausted.

MICA

Mica is a non-conductor of electricity and has a special place in the electrical goods industry. It is obtained in layers and has

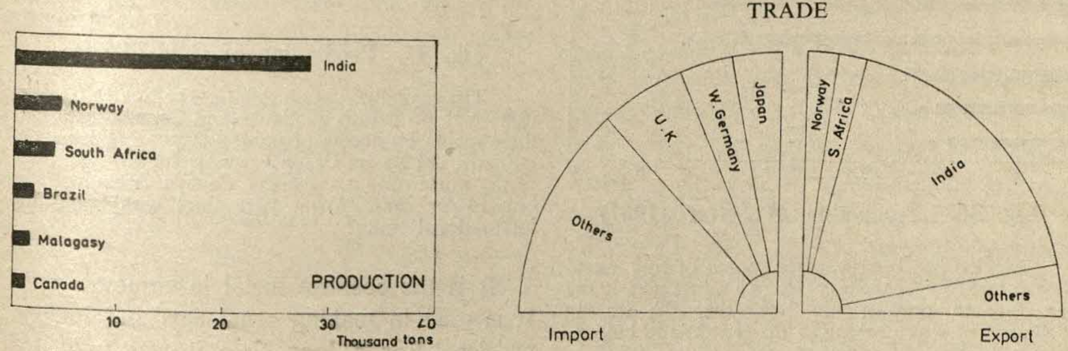


Fig. 35. Mica—Production and Trade

It is an important strategic mineral. During World War II, it was flown by air to the United States from India. In 1961, India exported 26,000 tons of mica valued at 97 million rupees. What is the special use of mica?

many colours. It can be split into very thin sheets, even to the thickness of a fraction of a millimetre. Mica that cannot be split is used in paints and varnishes, in medicine, as lubricant, and for several other purposes.

India is the largest producer of mica, accounting for about two-thirds of the total world output. In production, Gaya-Hazaribagh belt in Bihar leads both in quality and quantity. Nellore in Andhra Pradesh is another centre of production. Ajmer and Jaipur in Rajasthan, the Nilgiris in Madras, and Kerala also have mica mines. Skilful workers do the actual splitting by hand. (*See* picture 48.)

Norway, South Africa, Brazil, Malagasy, and Canada are other producers of mica (Fig. 35). The United States, the United Kingdom and the Soviet Union are the main buyers.

SILVER

Apart from its use in making ornaments and other luxury articles, silver is used in photography, dentistry, and in making coins. It occurs in pure form combined with gold, lead, zinc, or copper.

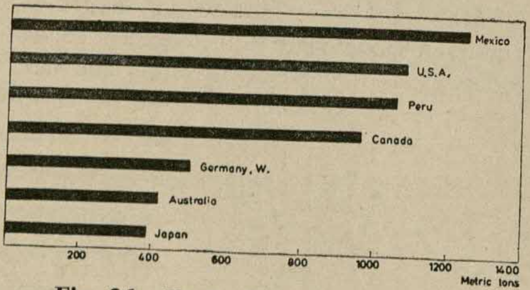


Fig. 36. Production of Silver (1961)

Mexico has been a major source of this metal for the last four centuries. Its rich mines give it the first place in production. Note that the leading producers of silver belong to the New World lands.

Mexico has rich mines in the Central Mountains. In the **United States**, the States of Idaho, Montana, Nevada, Texas, Colorado and Arizona produce silver. **Peru** is the third major producer of silver, and is closely followed by **Canada** (Fig. 36).

West Germany, Australia, Japan, Spain, Bolivia, Honduras, Yugoslavia, and the Congo are the other producers of silver. India produced only about 6 tons of silver in 1961, the bulk of which came from the Zawar mines in Rajasthan.

GOLD

Gold is one of the most precious metals. On exposure to the atmosphere, it is not oxidized as most of the other metals are. It has a very high malleability and ductility. It can be made into very thin sheets, less than a thousandth of a centimetre in thickness and can be drawn into very fine wires. Its attractive yellow colour takes a lustrous polish.

The discovery of gold in alluvial sands in the last century caused the famous *Gold Rush* in California, Alaska, and Australia.

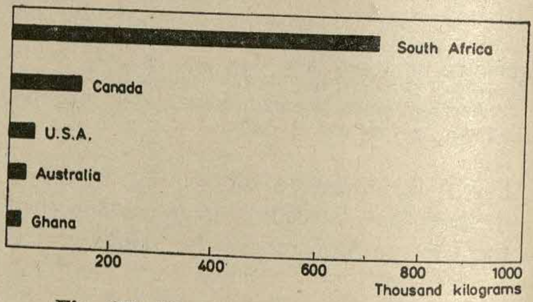


Fig. 37. Production of Gold (1961)

The Union of South Africa, the Soviet Union (for which no data is available) and Canada are the three major producers of gold. According to one estimate, the Soviet Union accounts for 23 per cent of the world output, whereas Canada accounts for only 14 per cent. What part does gold play in international trade?

It is the costliest metal in common use. It is used in making ornaments and luxury articles. For a long time it was used to make coins. It is used also as a medium of foreign exchange in international trade.

Gold is also used in medicine, dentistry and in chemical and electrical industries.

Gold occurs in a pure form as particles in alluvial sands or in quartz veins in igneous rocks.

In the placer and sluicing methods the gold bearing sands and gravels are washed in water till the heavy gold particles settle at the bottom. In the shaft and tunnel method, the gold-bearing rock is crushed fine and then the gold is washed as in the placer method. Nowadays potassium cyanide is used to dissolve gold so that even low grade ores can be utilized. Gold is then obtained by chemical methods.

Most gold mines produce silver as a by-product and practically all the silver mines produce some gold. Zinc, copper, lead and pyrite mines also yield gold and silver as by-products.

The **Union of South Africa** is the largest producer of gold. Johannesburg, Germiston, Benoni, Boksburg, Krugersdorp, and Klerksdorp are important centres in the Witwatersrand area in the Transvaal, South Africa (Fig. 37).

Canada is another large producer of gold with mines in British Columbia, Ontario, and the Laurentian Shield.

The production of gold in **the Soviet Union** with her new mines in the Lena gold field of Siberia north of Lake Baikal, often exceeds that of Canada.

The western Cordilleras of North America from Alaska to Mexico have a wide distribution of gold.

Ballarat and Bendigo in Victoria, Charlestown and Mt. Morgan in Queensland, and Kalgoorlie and Coolgardie in Western Australia are centres of gold production in Australia.

Ghana, Rhodesia, the Congo, Central America, Japan, China, the Philippines, Indonesia and India also produce some gold.

The chief gold mines in **India** are at Kolar in Mysore State. These are some of the deepest mines (2,700 metres) in the world. (*See* picture 49.) Minute quantities of gold are also found in various parts of the country. They are, however, hardly of any commercial significance. The total production of gold in India is less than 0.5 per cent of the world production.

POWER RESOURCES

To start with, man had to depend entirely on his own muscle power. Gradually he learnt to make use of animal power. Invention of a water wheel and wind mill were great landmarks in his effort to use water and wind as sources of energy. For thousands of years he depended upon wind as the motive power for his ships.

The present industrial era has little charm for muscle or animal power. In fact, new sources of energy ushered in the present industrial age. The rising standards of living, a peculiar phenomena of the industrial age, correspond very closely with the efficient use of power leading to increased productivity.

Energy is the persistent and pressing demand of the present industrial age. Industries depend on machines and machines are driven by power.

Heat obtained by burning coal is used to convert water into steam which, when compressed in the steel-case of a steam engine, gives power to run machines. The expanding gases in the ignition chamber of an oil engine also give power to drive machines.

Electricity can be generated by burning coal or oil, or by using the force of running water. Electrical energy can be changed into mechanical energy as a motive force, to run machines.

Efforts are being made with some success to use atomic energy for running big machines. Energy derived from the sun, the tides and the heat in the interior of the earth, these are all likely to be used in the near future. But coal, mineral oil and hydro-electricity are by far, the most widely used sources of energy at present.

The reserves of coal and oil are finite. One day or the other, they are likely to be exhausted. They cannot be replenished like commodities derived from plants or animals. But the store of water required to generate hydro-electricity is replenished continually by nature through rain and snowfall. The energy derived from the sun, the wind, the tides and the atoms, is also inexhaustible for all practical purposes.

COAL

Coal is a solid and amorphous *substance* comprising a large amount of carbon. It is formed by partial decomposition of vegetal material. The vegetal material was the residue of forests which grew luxuriantly in bogs and swampy areas, millions of years ago. Layers of sand, clay and silt forming sedimentary rocks were laid down between periods of plant growth. Where the process of decay was slow and incomplete for lack of oxygen, forest deposits became peat which is the first stage in the formation of coal.

The change of peat into coal was brought about by earth movements, when these layers of buried forests were subjected to tremendous compression to form coal seams. The coal seams are, therefore, found in sedimentary rocks and not in igneous, or metamorphic rocks. Coal itself is thus a sedimentary rock and the seams are folded or faulted like the sedimentary rocks which contain them.

Coal is generally obtained in four varieties, depending on its carbon content and properties.

Peat is a brownish porous substance. It is light and greasy and is soaked with water. Even after drying, it burns with difficulty giving out a lot of smoke. It is thus a mediocre fuel in spite of its fairly high carbon content—about 50 to 60 per cent. On distillation it yields coke, tar, ammonia, fuel gases, and other products.

Large swampy areas where peat is known to be currently accumulating are in Sumatra, along the coasts of Ceylon, New Zealand, Cuba and Florida, particularly in their mangrove areas.

Lignite or brown coal contains only about 40 per cent carbon and considerable amount of moisture. The moisture dries out after mining and the coal falls to pieces. It is light in weight, but being bulky the cost of transport becomes prohibitive; and so it is better used up, at or near the mining areas. About 15 per cent of the world's coal mined is lignite (Fig. 38).

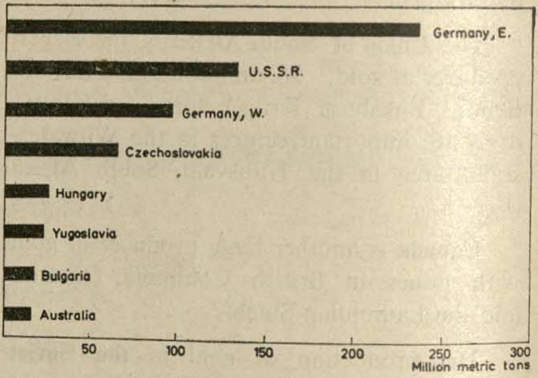


Fig. 38. Production of Lignite (1961)

According to one estimate about two-fifths of the world's resources of coal are lignite. East and West Germany together account for more than half the lignite mined in the world. About four-tons-and-a-half of German lignite are considered to be the equivalent of a ton of bituminous coal. In Czechoslovakia, this ratio is as high as 1.7:1. Name the important lignite mines in India.

Bituminous coal is a soft coal and contains about 70 per cent carbon. This is the most common variety. It includes the *coking coals*, the *steam coals* and the *gas coals*, so named according to their use. When converted into coke, the blast furnace fuel, it yields such by-products as coal tar, and chemicals like ammonia and benzene. It is also used as a raw material for the production of fertilizers. *Bunker coal* used in transport by ships, is also of this type. About 80 per cent of the world's coal that is actually mined is bituminous (Fig. 39).

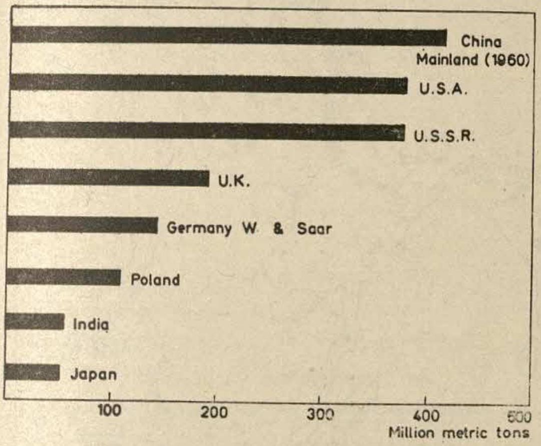


Fig. 39. **Production of Bituminous Coal and Anthracite (1961)**

China possesses the largest known coal reserves of the world, and is now the leading producer of coal. (Note that the figures for Chinese coal production include lignite.) Why is the Northern Hemisphere called the coal hemisphere?

Anthracite contains more than 90 per cent carbon. It is hard and cannot be easily ignited. It gives a considerable amount of heat and burns without smoke and is, therefore, mostly used as domestic fuel. It cannot be converted into coke which is the fuel of the blast furnace. About 5 per cent of the world's coal mined is of this variety.

Coal Reserves—Of the large world reserves of coal, North America has 40 per cent; Asia has about 46 per cent; and Europe has 13 per cent.

Principal Coal Fields

China—The coal reserves of China are estimated to be very large. According to the figures available for the year 1960 it occupies the premier position in the production of coal, although the figures for its coal production cover lignite as well.

Its coal-fields are in Shansi, Shensi, Szechwan, Kansu, Honan, and Manchuria. The fields in Shansi and Shensi lying in the North-West are among the most remarkable coal-fields of the world (Fig. 40).

The United States—In the United States more than 70 per cent of the coal is mined in the vicinity of the Appalachian Mountains. Most of this coal is bituminous. There are three important sub-divisions of this Appalachian coal-field, *viz.*, (a) Northern Appalachian (Pennsylvania, Ohio, and West Virginia), (b) Middle Appalachian (Kentucky) and (c) Southern Appalachian (Tennessee and Alabama).

The second coal-field is known as Interior coal-field. It is divided into two sub-coal-fields—(*a*) Eastern Interior (Illinois and Indiana) and (*b*) Western Interior (Iowa, Missouri, Oklahoma).

The third coal belt is along the eastern side of the Rocky Mountains (Montana to New Mexico). The Pacific Coal-fields, in Washington and Oregon, mine lignite or inferior coal (Fig. 41).

The Soviet Union—About 16 per cent of the world output is mined in the Soviet Union. It follows the United States very closely in coal production. The Donetz field is by far the most important. The Ural and the Tula (near Moscow) are important fields in European Russia. In the Asian part, the Kuznetsk and Karaganda fields are valuable and are growing in importance. Nearly 80 per cent of the Soviet coal reserves lies in Soviet Asia, far away from the major industrial centres and densely populated regions (Figs. 40 and 42).

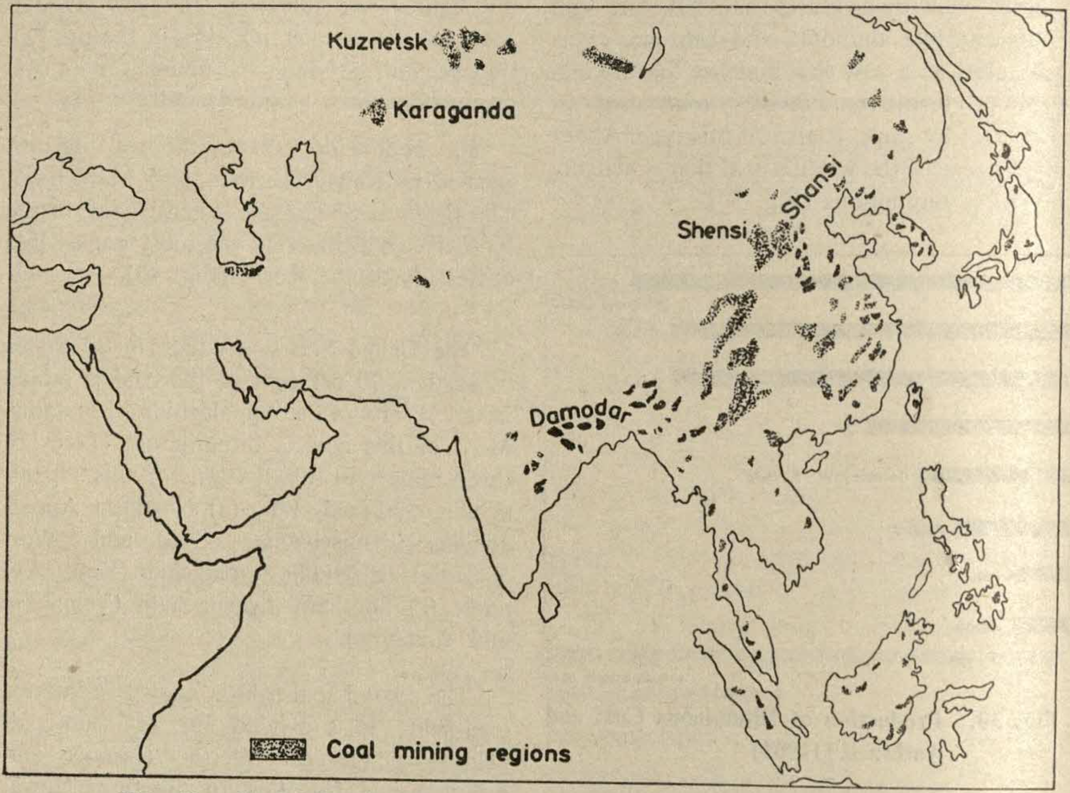


Fig. 40. Coal-fields in Asia (Adapted from Oxford Economic Atlas.)

The coal deposits in Asia form a sort of broken ring around the upland heart of the continent. Most of it is in Siberia and China, and a little in India. Compare the positions of China and India in respect of iron and coal deposits.

The United Kingdom—The important coal-fields of the United Kingdom are on the flanks of the Pennines, in the Midland Valley of Scotland and in Southern Wales. The famous Yorkshire field is on the eastern flank of the Pennines, whereas small but highly productive fields extending from Lancashire to the Midlands region are on the western flank. The Cardiff-field in South Wales is eminently suited for export trade (Fig. 42).

West Germany—Germany stands only next to the United Kingdom in the production of coal. The Ruhr basin is by far the most important and productive coal-field of Germany. It is especially noted for its coking coal. The Saar coal-field is yet another important coal-field of Germany. It is a small field but possesses high quality coal. German coal-fields are well served with cheap inland water and rail transport. It also possesses large reserves of lignite around Cologne.

Poland—With the Silesian coal-fields, Poland now stands next to Germany in coal production. This coal-field stands second only to the Ruhr field. It yields steam and coking coal.

India—It has been estimated that the coal reserves in India are about 60,000 million

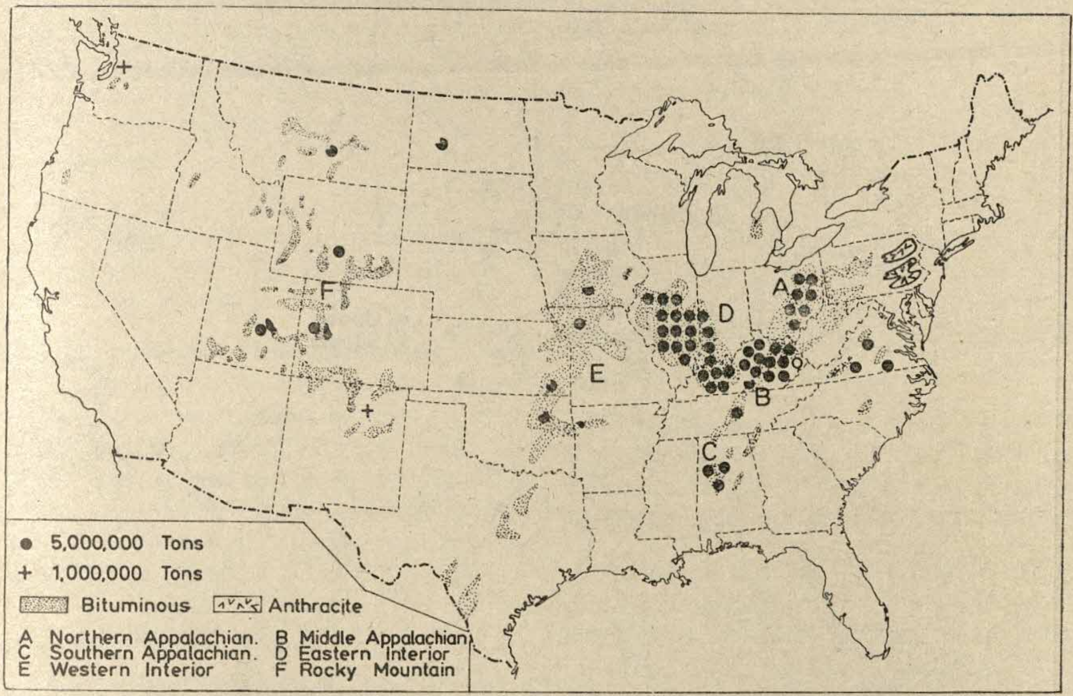

● 5,000,000 Tons
+ 1,000,000 Tons
▨ Bituminous
Anthracite
A Northern Appalachian. B Middle Appalachian
C Southern Appalachian. D Eastern Interior
E Western Interior F Rocky Mountain
A
B
C
D
E
F

Fig. 41. Coal-fields in the United States (Adapted from C.F. Jones and G.G. Darkenwald.)

Coal is widely distributed in the United States. Active mining of coal, however, is confined to the fields east of the Mississippi. How would you account for it?

metric tons. Nearly 80 per cent of these reserves lie in the Damodar Valley, that is, in the well-known fields of Raniganj, Jharia, Giridih and Bokaro. (*See* picture 46.)

Coal is also found in the valleys of the Godavari, Wardha, Son, and Mahanadi, and in the regions of Satpura, Chattisgarh, and Deoghar. Some coal is found near Darjeeling and in the Eastern Himalayas.

Jharia in Bihar and Raniganj in West Bengal produce about 80 per cent of the Indian total output. The coal-fields in other areas particularly in Madhya Pradesh, Maharashtra, and Andhra Pradesh are being developed. Some of the new coal mines are owned and worked by the Government (Figs. 40 and 60.)

Lignite is found in Madras, Rajasthan, Saurashtra, Kutch, and Kashmir. The Neyveli lignite mines in the District of South Arcot near Madras promise a new industrial centre in the south.

Japan—Many small fields occur in Japan particularly in Honshu and Hokkaido. The quality of Japanese coal varies from low-grade bituminous to high-grade coking coal. The reserves are low and the production is far from being adequate to meet the demands of her industries.

The other producers of coal are South Africa, Czechoslovakia, Australia, Belgium, Spain and the Netherlands.

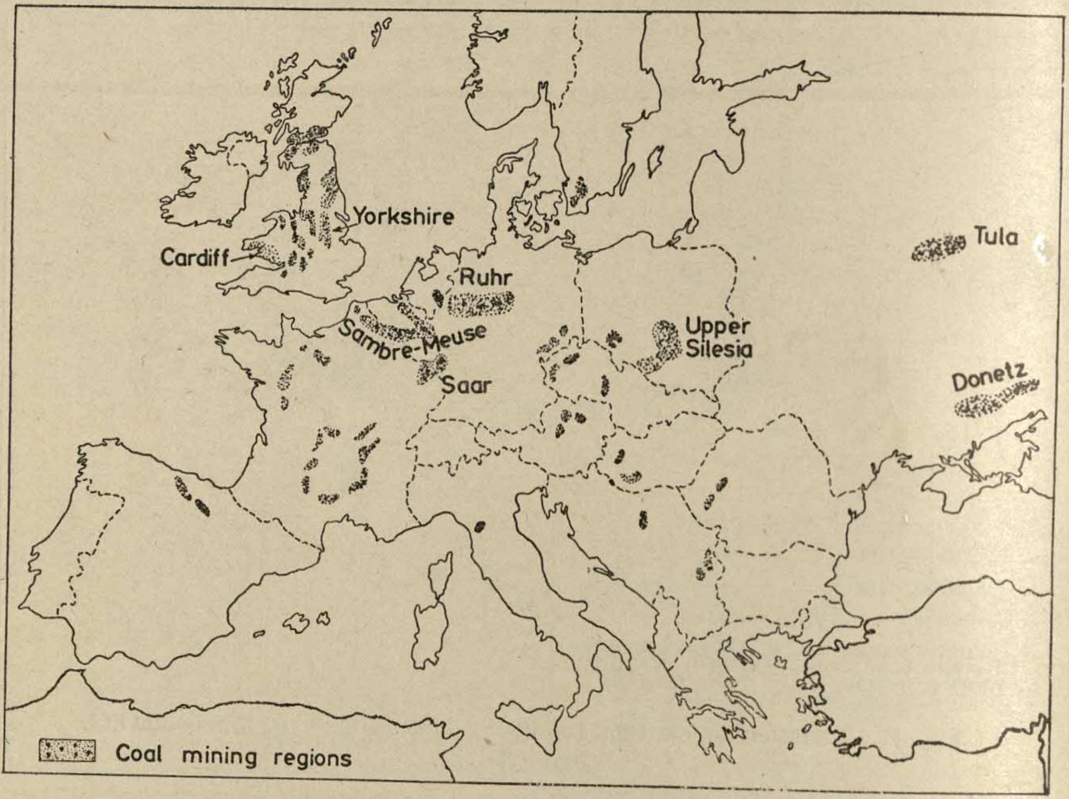


Fig. 42. Coal-fields in Europe

Europe possesses the most productive coal-fields, although her total reserves are not as large as that of Asia or North America. What are the factors that make these fields highly productive?

MINERAL OIL

Mineral oil was in use from ancient times in Iraq (Mesopotamia) and Egypt. In countries like Rumania and Burma, hand-dug wells were in use to obtain oil for use in lamps. It was also used in the preparation of ointments and medicines. But the modern petroleum industry came into being only after 1859 when the first oil well was drilled to a depth of 21 metres in Pennsylvania. It yielded twenty-five barrels of oil per day.

Mineral oil, crude or refined, is used as fuel for ocean liners and locomotives. It is used as oil for lamps in the form of kerosene. In the form of petrol (gasolene), or aviation spirit, it is used as a source of power for automobiles, trucks, and aeroplanes. It serves as a lubricant for machines to reduce friction. It is a source of such products as benzene, naphtha, paraffin wax, ether, vaseline, medicines, and tar. Tar in its turn produces aniline dyes and other products.

Petroleum occurs in sedimentary rocks—sandstones, conglomerates, shales, and limestones. It is believed that in ancient times, vegetable matter was deposited in sands in lakes or stagnant brackish water on the seaward side of great deltas of rivers. Certain types of bacteria developed in these deposits and their remains interacting with the vegetal matter converted them into oil. The oil accumulated in gentle anticlines in bands of porous sand between impervious layers of clay or shale.

The oil sands usually contain water also, so that in the anticlinal formation of beds of sediments, oil floats above water and a layer of gas collects at the top of the oil.

As the anticlinal strata containing oil are not easily seen on the surface, methods based on scientific investigation have to be developed for "prospecting" for oil. Although a petroliferous area may be known, there still remains the task of locating the accumulation of petroleum in "pools" which can be commercially exploited.

Principal Oilfields

The United States—The United States rank first in the production of petroleum. It produces nearly 30 per cent of the world's mineral oil and has the most actively exploited oil deposits in the world. Pipelines which run across the country taking oil to the ports and to the industrial areas total nearly 160,000 kilometres in length (Fig. 43).

The Appalachian oilfield was the first important oilfield developed in the United States. It is known for its long period of steady production. This is the nearest field to the most industrialized region. The field stretches from New York State to Tennessee.

The Mid-continent field is the largest and the most important oil-producing area in the country today. It is one of the leading oilfields of the world. It extends over Central and Western Texas, Southern Arkansas and Northern Louisiana.

The other oilfields are those of California, Rocky Mountain region and the Ohio-Indiana States.

The Soviet Union—The Soviet Union is the second largest producer of oil in the world, accounting for nearly 15 per cent of the world production.

Fields were first developed near Baku on the Caspian Sea and Grozny and Maikop along the Caucasus. Oil from Baku and Grozny is taken to the Black Sea ports by pipelines. The Baku oilfields extend well beneath the Caspian Sea where off-shore drilling is carried out on a very large scale. (*See* picture 51.)

New oilfields have now been discovered along the western edge of the Ural Mountains and also in the valley of the Volga, in Russian Turkestan and in the Sakhalin Islands.

Venezuela—It is the leading oil producing country in South America. It closely follows the Soviet Union in oil production and leads the world in oil exports. The fields lie in and around the shallow Gulf of Maracaibo. Small tankers take the oil to Willemstadt in Curaco Island in the Netherlands-West Indies where it is either refined or transshipped into large tankers.

Kuwait—The little territory of Kuwait at the head of the Persian Gulf has one of the richest oil deposits of the world. It stands fourth in oil production in the world. Burghan is the largest oilfield of Kuwait, the exploitation of which brings in large sums of royalty, to make the *per capita* income in Kuwait one of the highest in the World.

Saudi Arabia—This is another country in the Middle East with rich oil reserves. The major oilfields are those of Dhahran, Abqaiq and Ghawar. A 1,700-kilometre long pipeline connects her oil refinery at Ras Tanura on the Persian Gulf to the port of Sidon in the Lebanon on the Mediterranean Sea. This pipeline carries 350,000 barrels of petroleum every day and reduces the cost of transport considerably.

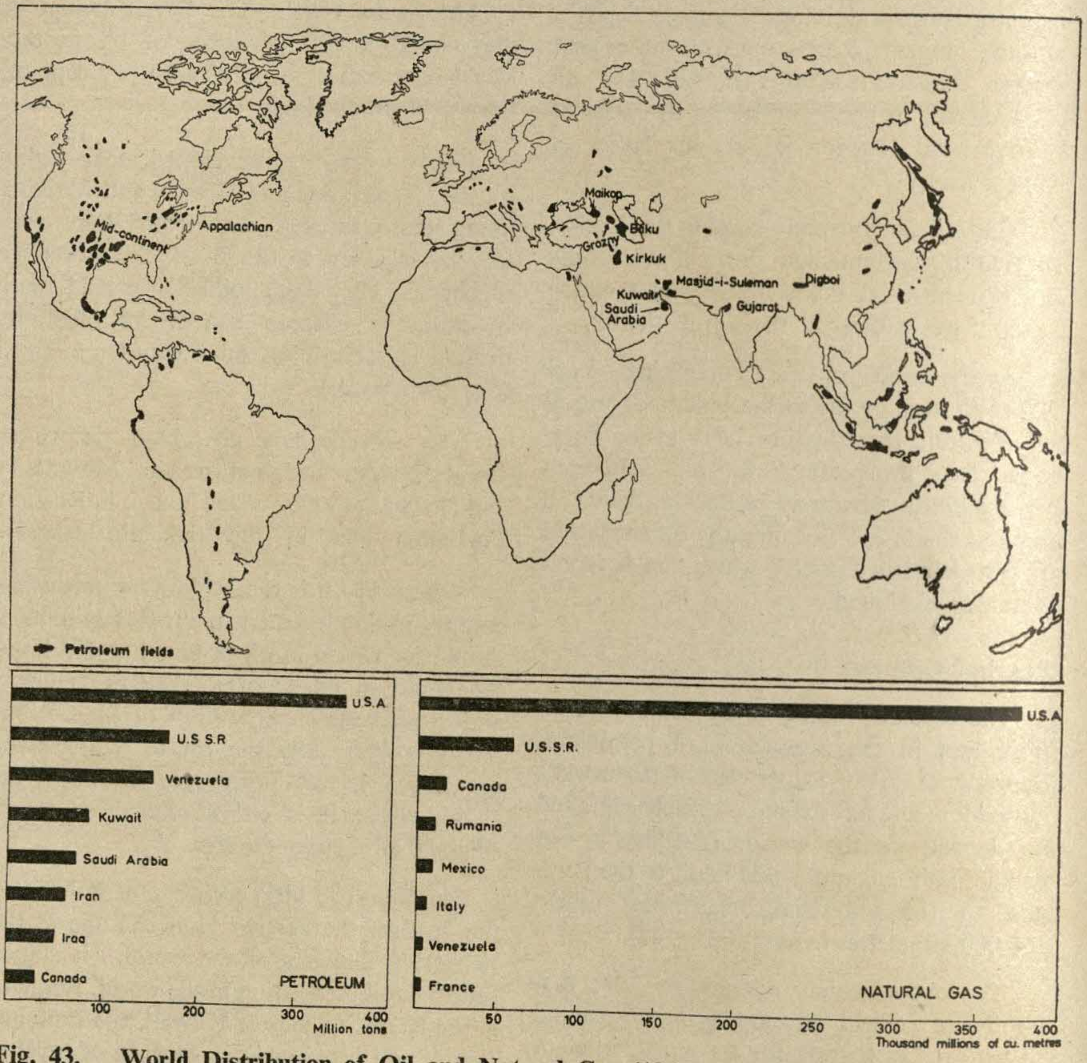
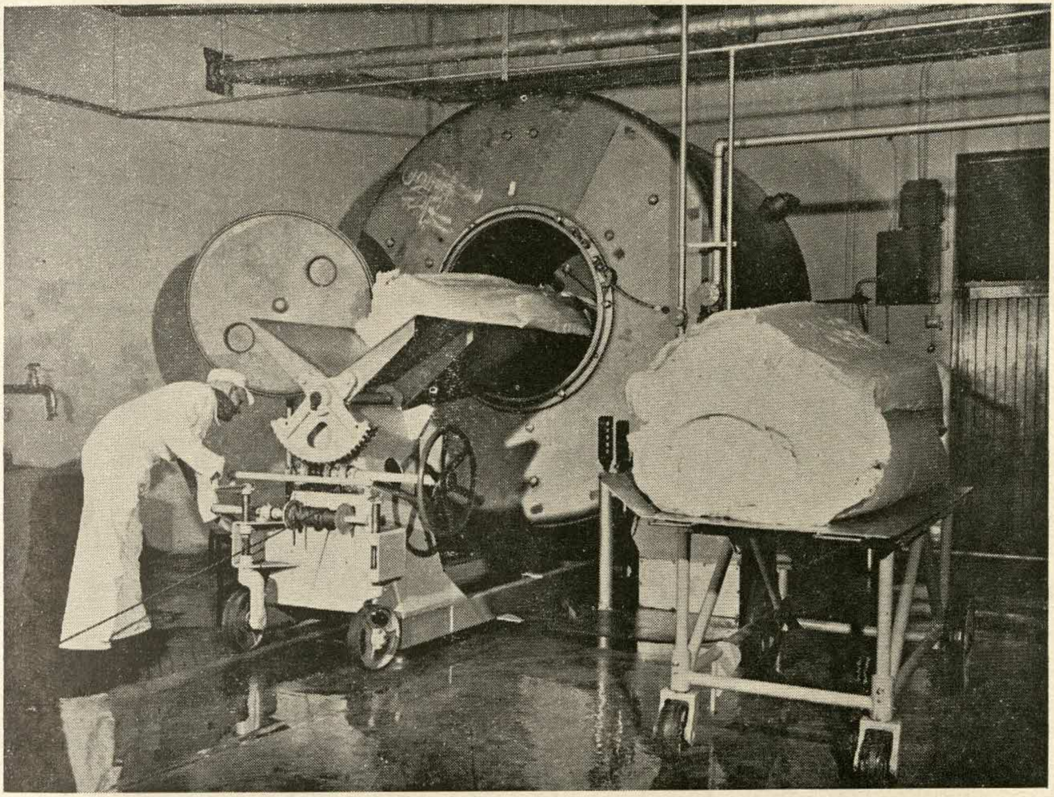


Fig. 43. **World Distribution of Oil and Natural Gas (1961)** (Adapted from C.F. Jones and G.G. Darkenwald.)

Note the major oilfields around the Caribbean Sea and the Gulf of Mexico, in the interior of North America, around the Black Sea and the Caspian and those around the Persian Gulf. Study carefully the distribution of oil and natural gas in relation to major manufacturing regions.

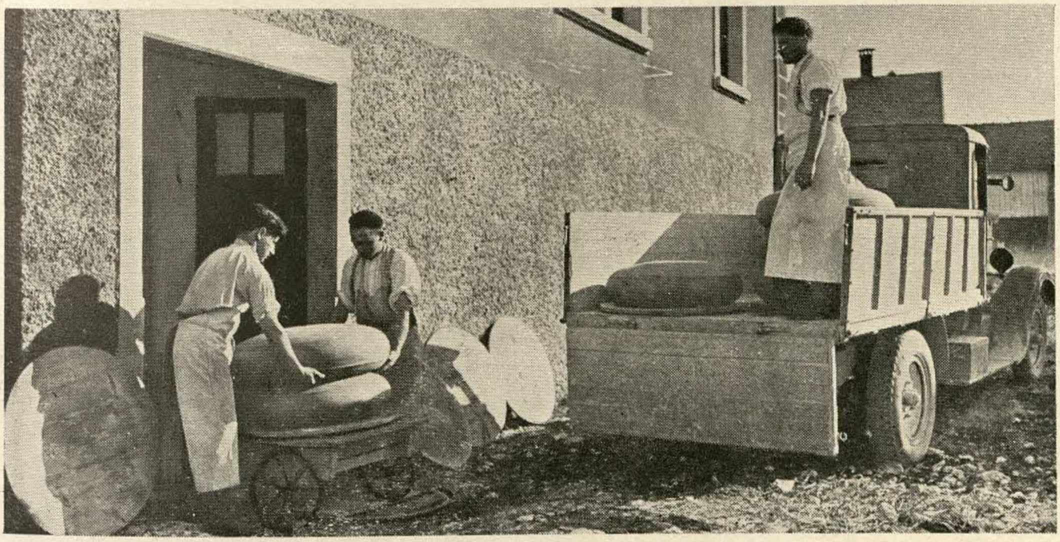
Iran—Its oilfields are near Maidan-i-Naphtan and Masjid-i-Suleman. The refinery at Abadan is perhaps the largest in the world, its capacity being 540,000 barrels a day.

Iraq—It is yet another country on the Persian Gulf having rich oil deposits. Its fields lie near Kirkuk on the south-west flank of the Kurdistan Mountains. The pipelines move oil to the Mediterranean ports at the rate of 30 million barrels a year. It takes about 21 to 25 days for oil to reach the Mediterranean port through these pipes.



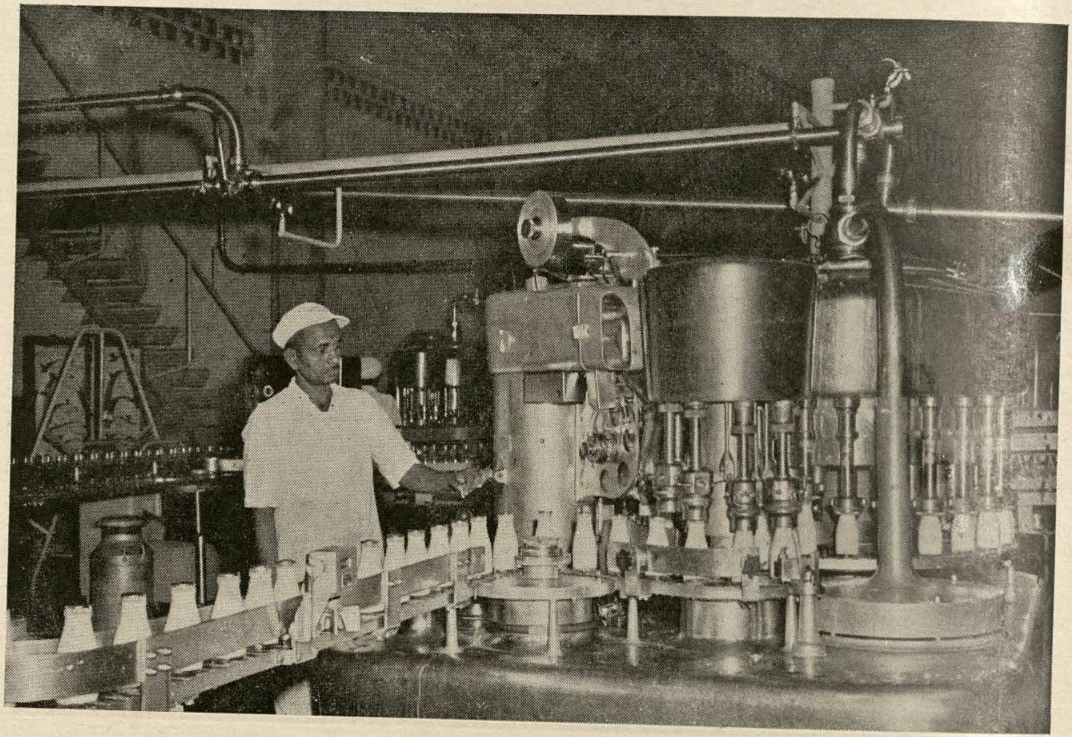
41. A GIANT BUTTER CHURN (*Courtesy: New Zealand High Commission, New Delhi.*)

The giant stainless steel churn belonging to a co-operative company churns two tons and a half at a time. The country exports about 165,000 *tons of butter annually. Where can you see such a big churn owned by a co-operative milk society in India?*



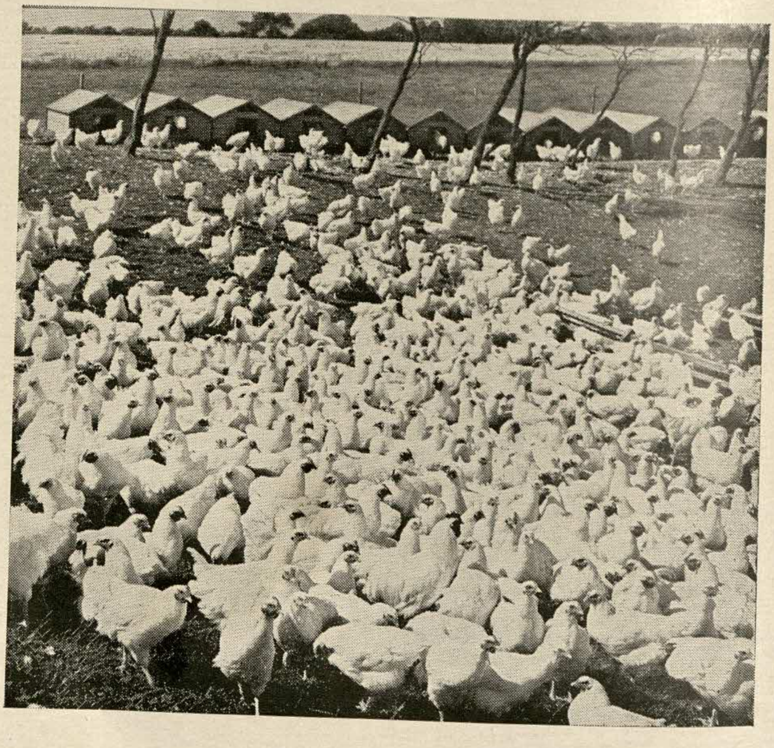
42. THE DESPATCH OF SAVOY CHEESE (*Courtesy: Embassy of France, New Delhi.*)

France is the second largest producer of cheese only next to the United States. What makes France the largest producer of cheese in Europe?



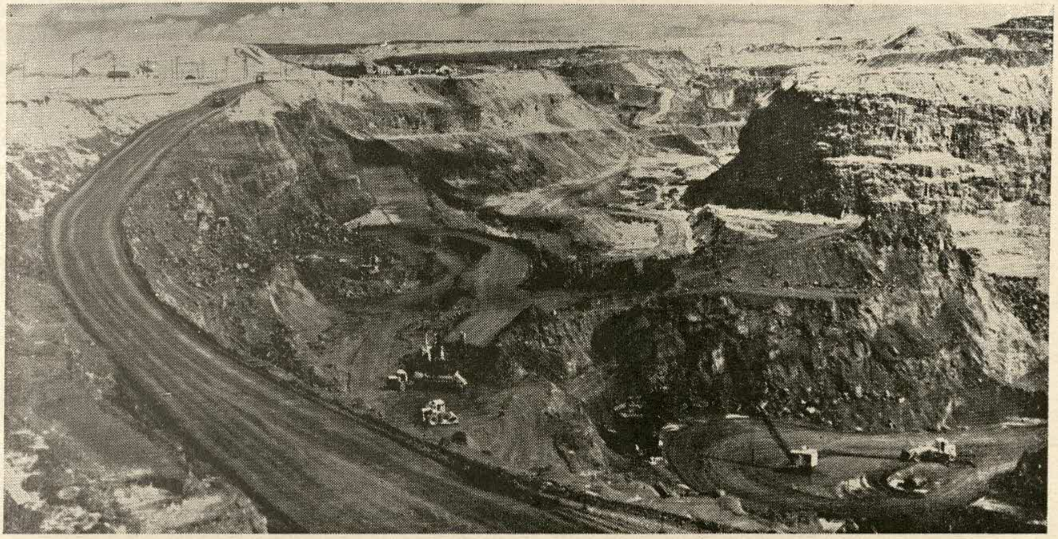
43. A BOTTLING PLANT OF THE DAIRY AT WORLI, BOMBAY (*Courtesy: Photo Division Min. of I and B., New Delhi.*)

Note how the bottles are automatically filled and sealed while moving along the conveyor. What is the relationship between dairy plants and large cities like Bombay?



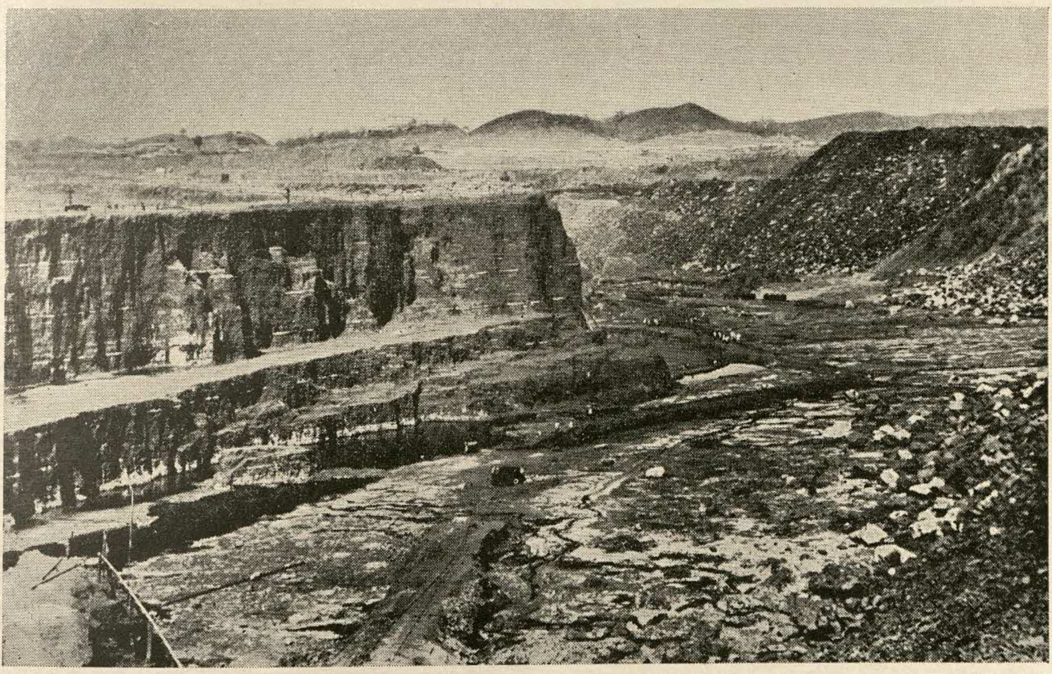
44. A POULTRY FARM IN DENMARK (*Courtesy: Royal Danish Embassy, N. Delhi.*)

Every Danish farmer breeds poultry on his farm. A Danish hen on an average lays 185 eggs per year. Rigorous quality control ensures a high standard of the eggs exported from the country. How does this strict control help the individual farmer?



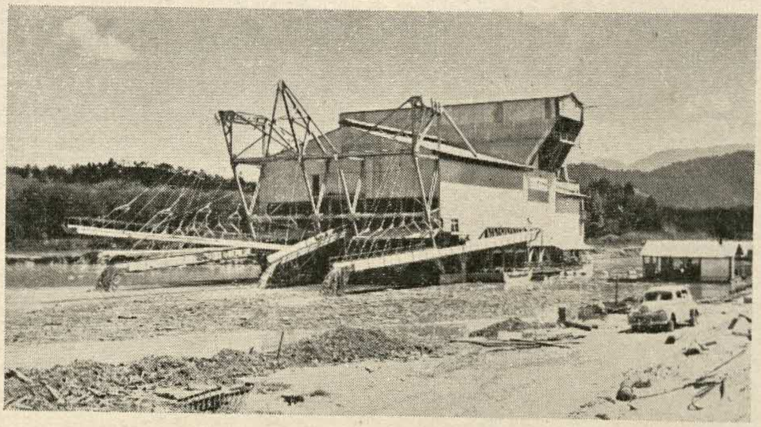
45. An Open Pit Iron Ore Mine in Minnesota (*Courtesy: U.S.I.S., New Delhi.*)

Lying near the edge of the Canadian Shield, this open pit iron mine in Minnesota is located on one of the richest iron ranges in the world. Electric shovels scoop up fifteen tons of iron-ore at a single bite. Heavy trucks each with a capacity of 30 tons, transport the ore to a loading station wherefrom it is raised to the surface by means of a conveyor belt. Why are these mines worked only during the open season?



46. The Thickest Surface Coal Seams of Bokaro (*Courtesy: Geological Survey of India, Calcutta.*)

This thirty-metre coal quarry at Bokaro is claimed to be the thickest in the world. What difficulty would be experienced in operating such a thick seam through a shaft mine?

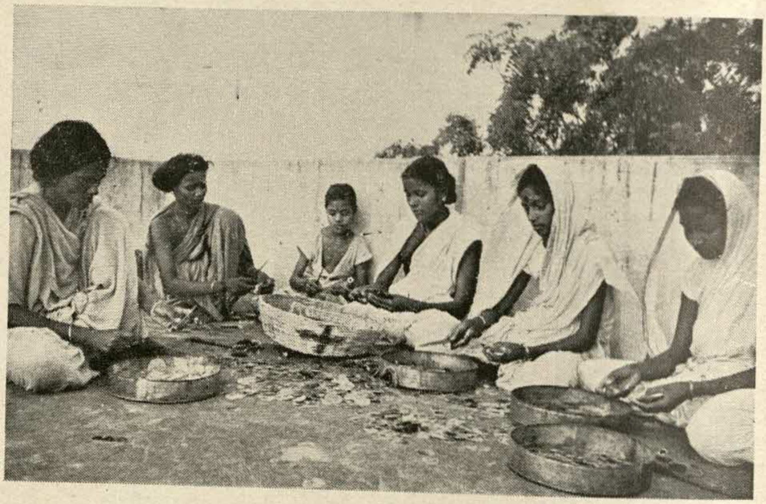


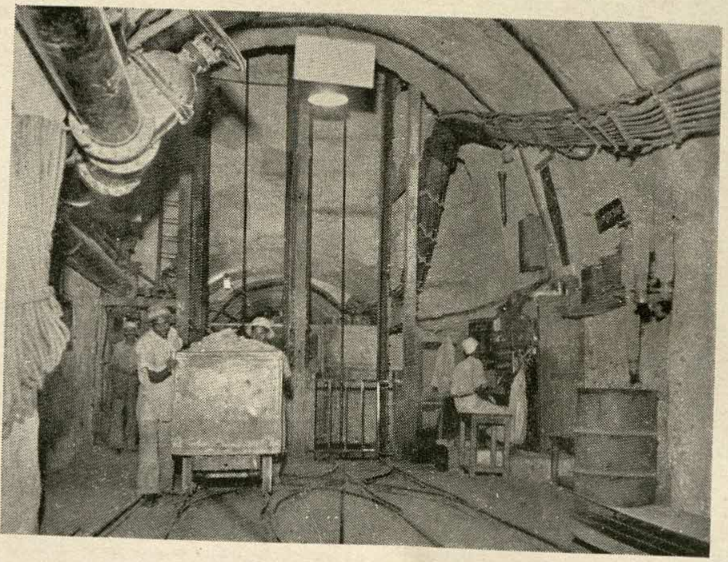
47. Tin Mining in Malaysia (*Courtesy: Malaysian High Commission, New Delhi.*)

Areas of deep tin-bearing swampy ground are worked by dredges like this. There were 71 *dredges operating in Malaysia in* 1963, *each one costing* 10 *million Malaysian dollars. How does tin mining in Malaysia differ from many other areas?*

48. Cutting and Splitting of Mica (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

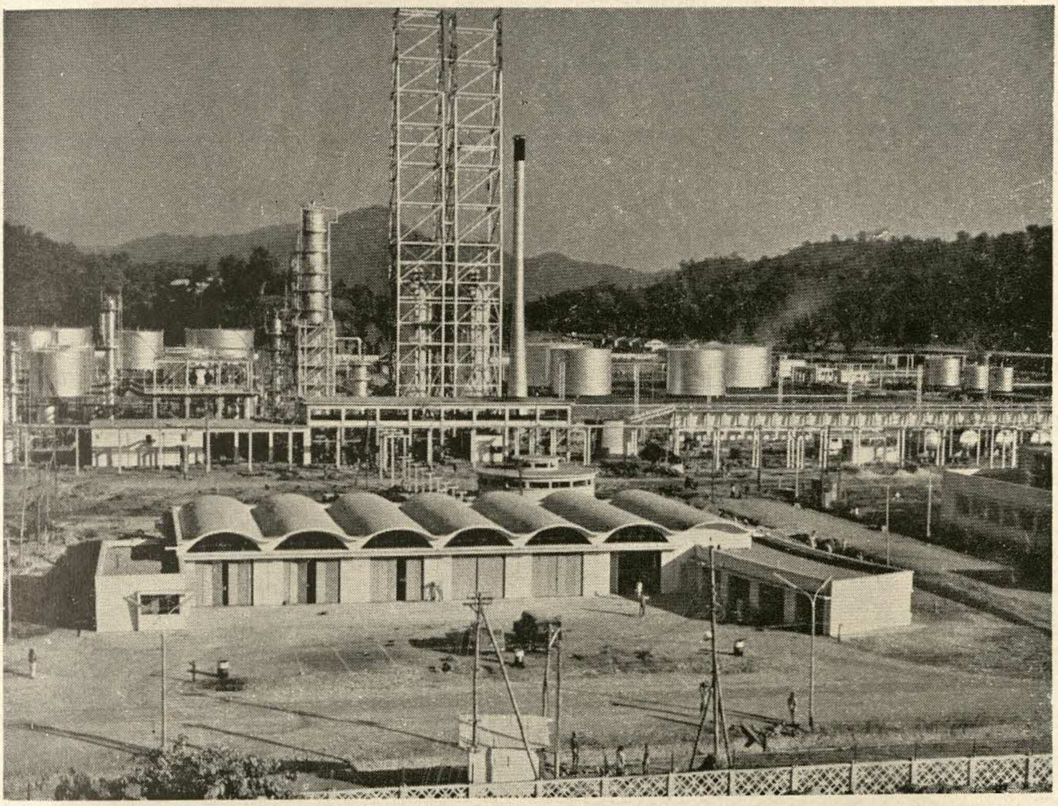
Cutting and splitting of mica to required shape and size is a delicate task. Why are big blocks of mica called 'books of mica'? Why has it not been possible to mechanize mica splitting?





49. A Control Centre in the Kolar Gold Mines (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

Kolar Gold Mines represent one of the world's deepest shaft mines. This control centre is situated 1,524 *metres deep below the surface. How does an open pit mine differ from a shaft mine in respect of depth and cost of operation?*

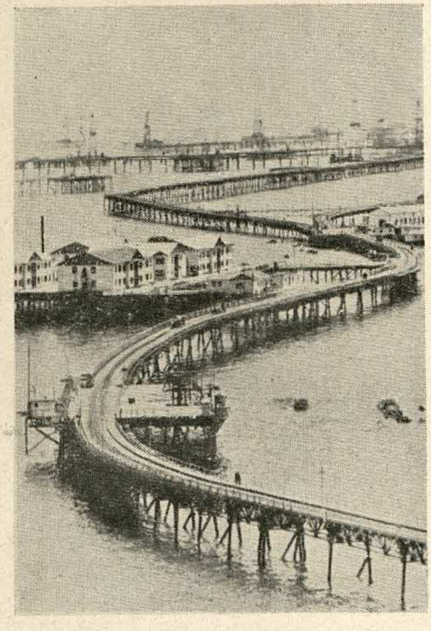


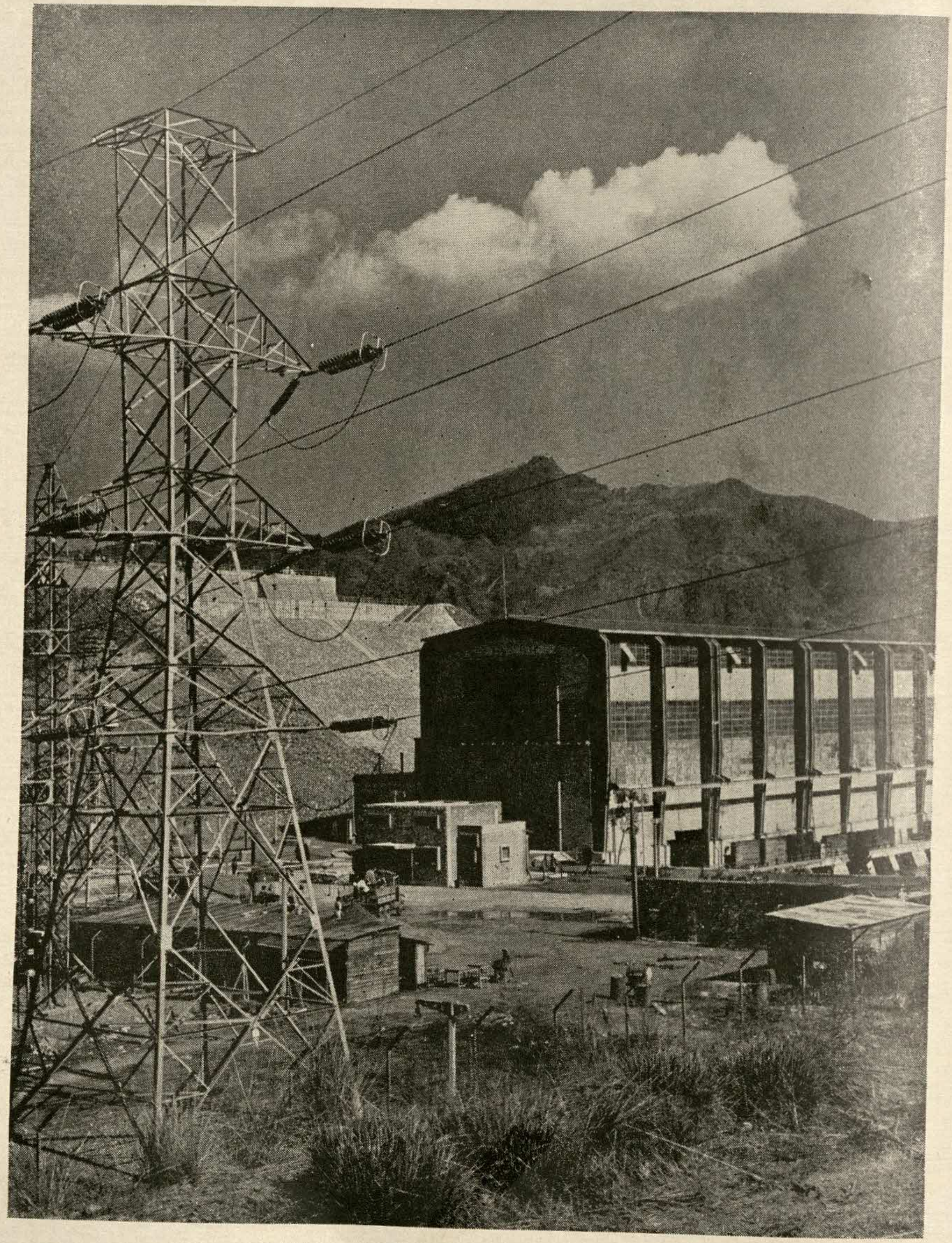
50. NOONMATI OIL REFINERY IN ASSAM (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

This oil refinery near Gauhati in Assam is the first state-owned refinery in India. It was set up in collaboration with Rumania and has an annual capacity of 750,000 *tons. Which are the other State-owned refineries in India?*

51. OFF-SHORE OILFIELD IN THE SOVIET UNION (*Courtesy: Information Deptt. U.S.S.R. Embassy, New Delhi.*)

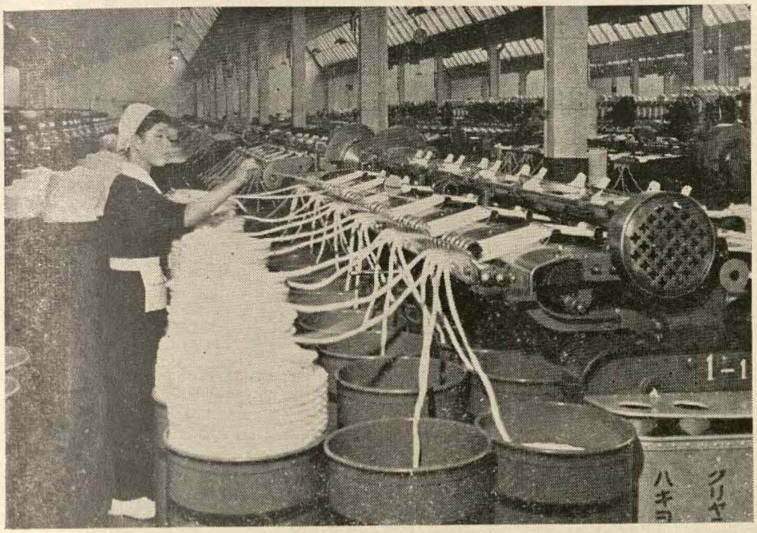
There are several off-shore oilfields in the Soviet Union particularly along the Caspian Sea. In what other parts of the world are there such off-shore oilfields?





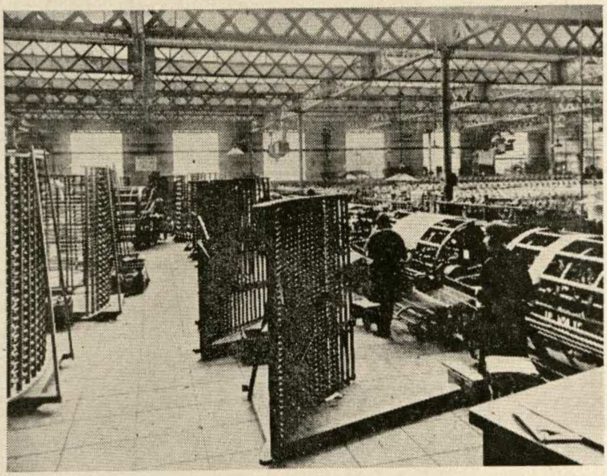
52. GANGUWAL POWER HOUSE IN THE PUNJAB (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

This is one of the three power houses of the Bhakra Nangal Project which together produce about 600,000 kilowatts of hydel-power. Locate this place on the map. Which range of the Himalayas do the hills in the picture belong to? Why are the power houses located at three different places?



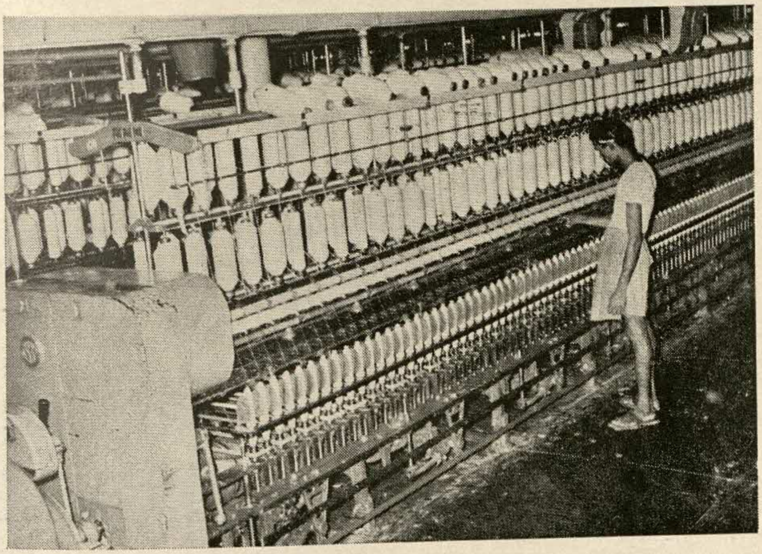
53. Drawing Frames in a Spinning-mill in Japan (*Courtesy Japan Information Centre, New Delhi.*)

A spinning-mill such as this cleans, cards, and spins raw cotton into yarns. Modern textile industry in Japan developed after it designed efficient spinning machines to utilize shortstaple cotton from India. In what part of Japan will you expect this mill?



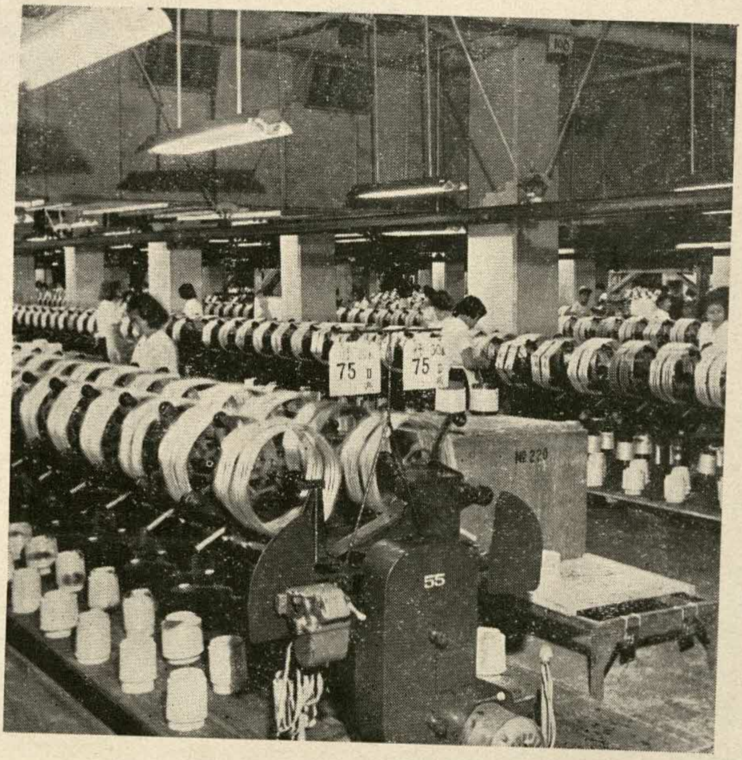
54. Warping of Silk Yarn in a Factory at Lyons (*Courtesy: Embassy of France, New Delhi.*)

Note the silk threads being stretched lengthwise in looms to be crossed by weft. What is a warp and a weft? How does the silk yarn differ from the cotton yarn?



55. A Spinning Section of a Bombay Textile Mill (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

Hundreds of spindles are being looked after by one person as the machine whirls them. Out of 13,863,000 *spindles in India in* 1961, *Bombay city alone accounted for* 3,200,000. *What factors favoured the early development of the modern cotton-textile industry at Bombay?*



56. A REELING SECTION OF A RAYON MILL IN JAPAN (*Courtesy: Japan Information Centre, New Delhi.*)

Preparation of solution, spinning and finishing are the three stages in the making of rayon. The final product is affected by the purity of materials, temperature, pressure, time, efficiency of machines and human skill in handling. What is the major handicap of the rayon industry of Japan?

57. INSPECTING MACHINE AT WORK (*Courtesy*: *Japan Information Centre, New Delhi.*)

The quality of the fabrics is verified automatically with the help of machines such as this. How does quality control help in promoting sales?

It is claimed that more than half of the world's crude oil reserves lie in the Persian Gulf region or in South-West Asia. These fields together produce a quarter of the world's oil. This area is the major supplier of crude oil to the refineries in Western Europe, Asia and Australia. The huge amounts of money received as royalties by the underdeveloped countries are helping to change their economy rapidly, while creating new problems in their wake.

The other important producers of oil are Canada, Indonesia, Mexico, Algeria, Argentina, and Rumania.

As compared to these countries, the production of oil in India is rather insignificant. In 1961, India produced half million tons of crude petroleum. In 1962, however, its production was doubled.

India has oilfields at Digboi and Naharkatiya in Assam. But recently, oil has been discovered in Gujarat in fairly big quantities. The new oilfields are located around Baroda, Ahmedabad, Ankleshwar, and Cambay. A number of oil refineries have sprung up in different parts of the country—Digboi, Nunmati, Barauni, Vishakhapatnam, Cochin, Bombay, and Koyali. Two refineries at Madras and Haldia near Calcutta are to be set up shortly. (*See* picture 50.)

NATURAL GAS

Natural gas is found associated with mineral oil in many of the oilfields. In the beginning, this gas was allowed to go waste; but now it is taken to industrial areas where it forms a useful source of power and to towns where it is used as a domestic fuel, and as an illuminant. As in petroleum, the United States is the chief producer of natural gas (Fig. 43).

In India, natural gas was struck at Jwalamukhi in the Punjab and at Mahuvej, Ghogha and Vadesar in Gujarat. In Pakistan, natural gas was struck in the Sui area.

The Government of India have established the Oil and Natural Gas Commission for the exploration and production of oil and gas; the Indian Refineries Ltd., for the construction and operation of refineries; and the Indian Oil Company for the distribution and marketing of the petroleum products.

WATER-POWER

The force of running water has been used for a long time to drive paddle wheels as the force of wind has been used to run wind mills and sailships. But the invention of the turbine and the dynamo has made it possible to use water-power to generate electricity.

Electricity can be and is in a large measure generated by burning fuels like coal or oil; but this thermal power is generally more costly than water-power. The production of thermal power also depends on the adequate and continuous supply of coal or oil.

The source of water-power, on the other hand, is inexhaustible. But certain conditions are necessary for the generation of hydel-power, or hydro-electricity, that is, electricity generated from running water.

The amount of energy in running water depends upon the volume of water and the velocity of the current. The velocity of flowing water depends, in its turn, on the gradient of the stream.

A continuous and sufficient supply of water that is necessary for the development of hydro-electricity depends on equable rainfall. This means that the annual rainfall should be adequate, assured and well-distributed throughout the year.

Where the rainfall regime is not equable, water has to be stored behind dams built across rivers to assure a regulated and continuous water supply all the year round. A dam-site in the upper course of a river in hilly areas is more suitable as it often suffers less evaporation. In such areas, there are more natural hollows which can be used for storing the water. The high head of water gives a greater pressure because of the force of gravity to the turbines below. Finally, a steep gradient or slope adds to the force of running water. As against this, it must be remembered that the greater volume of water in the lower course of a river compensates to some extent, the smaller gradient and absence of gravity falls.

Industries and other consumers of power should be situated within easy reach of the centres of power production, for power can be transmitted by high tension wires, without significant losses, only up to about 500 kilometres. Although large capital investments are needed for the construction of dams, pipelines, power houses and transmission lines, the absence of other sources of energy like coal or petroleum usually encourages the development and use of hydel-power potential.

Potential and Developed Water-Power

The power that could be generated if all the water-power resources in a country are used is known as its *potential water-power.* Some countries of Europe like, Germany, Italy, France and Switzerland and the United States in North America have made use of much of their potential water-power. The potential water-power thus harnessed is called the *developed water-power* (Figs. 44 and 45).

The total potential water-power of the world has been estimated to be about 650,000 million horsepower. Of the total potential water-power of the world, about 20 per cent has been developed. In potential water-power Africa with 38.7 per cent leads the other continents and is followed by Asia (24.0 per cent), North America (14.2 per cent), Europe (9.8 per cent), South America (9.7 per cent), and Oceania (3.6 per cent).

In actual developed water-power, Europe leads the world with 42.2 per cent and is followed by North America (40.6 per cent), Asia (11.6 per cent), South America (3.1 per cent), Oceania (1.6 per cent), and Africa (0.9 per cent).

Principal Water-Power Regions

The United States is by far the most important producer of hydel-power. It alone accounted for 12.4 per cent of the total water-power produced in the world in 1961. Its important water-power-producing regions are the northern and north-eastern parts extending from Maine to Minnesota. Besides the giant Niagara Falls, a large number of streams and lakes, in close proximity to the great consuming centres, make this an important water-power-producing region.

The famous "Fall Line" to the east of the Appalachians is another region with well-developed water-power. In fact, a series of industrial towns like Raleigh, Washington D.C., Baltimore, Philadelphia, and Trenton are situated near the waterfalls along this line.

The Tennessee and its tributaries, west of the Appalachian, offer suitable sites for producing hydro-electricity.

The Boulder or Hoover Dam across the Colorado and the Grand Coulee Dam across the Columbia produce large amounts of hydel-power.

Canada occupies the second position in the world, its production being 7.5 per cent of the world output. The water power at Niagara is jointly developed by Canada and the United States. The provinces of Ontario,

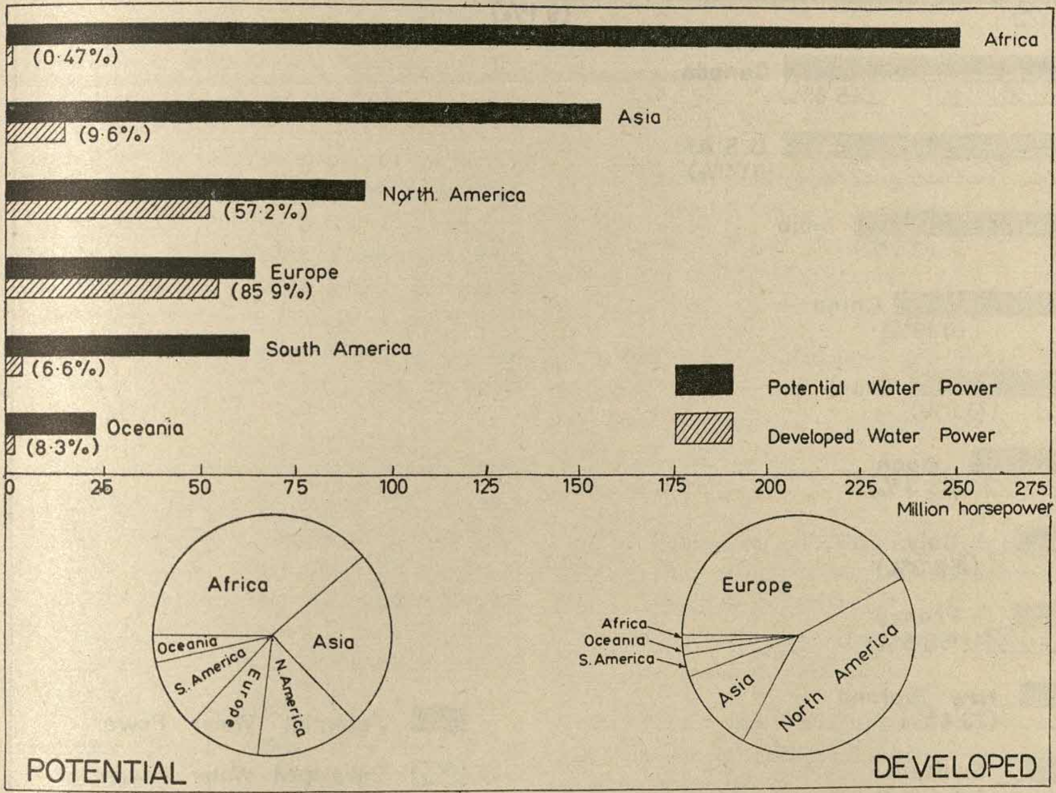


Fig. 44. **Potential and Developed Water-Power by Continents (1955)**
(Source: U. S. Geological Survey)

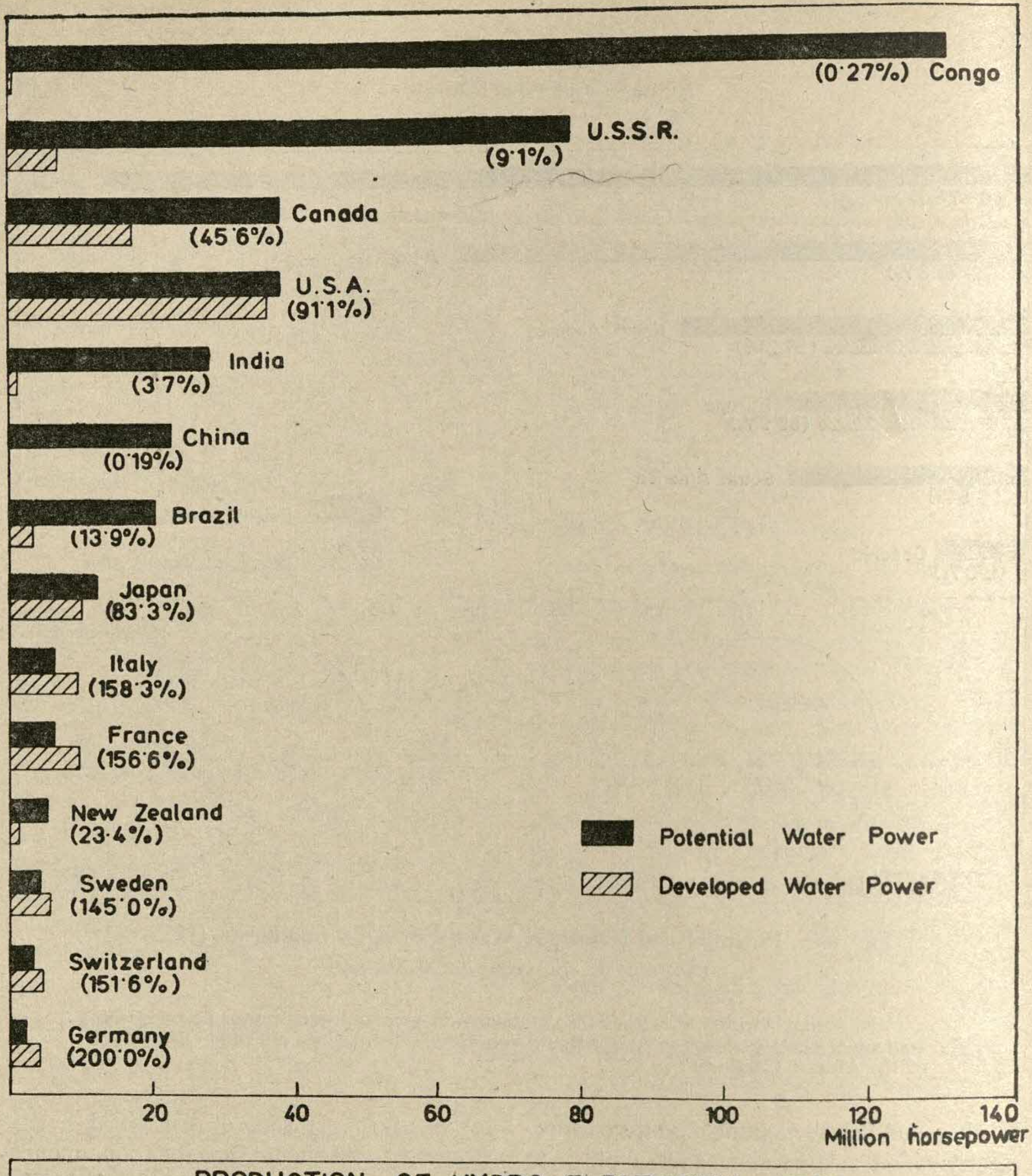
Note that Africa which leads the continents in potential water-power has the least amount of developed power. How would you account for the high potential water-power of the African Continent?

Quebec, and British Columbia produce hydro-electricity on a large scale and supply it to saw mills, wood pulp factories and other industries.

A very large number of the glacial lakes, rich forests and considerable rain and snow-fall ensure a favourable river regime for the regulated storage and supply of water. However, the cold winter freezing many of the lakes and rivers hinders continuous power production.

Japan was the third largest producer of water-power in 1961. It alone accounted for nearly 5 per cent of the world hydro-electricity. Abundant precipitation, mount-ainous topography, the need for industrial power and the zeal and energy of the Japanese people are the factors responsible for the development of its hydro-electricity. It had utilized 83.3 per cent of its potential water-power resources by the year 1955, accounting for nearly 70 per cent of the total water-power developed in Asia.

The Soviet Union stands only second to the Congo in potential water-power. In developed water-power, it stood sixth in the year 1955. But it has improved its position



PRODUCTION OF HYDRO-ELECTRICITY 1961

	Million kwh		Million kwh
U.S.A.	155,215	Norway	33,386
Canada	103,919	Switzerland	22,177
Japan	67,957	Brazil	18,946
U.S.S.R.	59,122	Austria	16,664
Italy	41,982	Spain	15,980
France	38,214	West Germany	12,919
Sweden	36,550	India	9,829

1 kwh = 1·341 horsepower

Fig. 45. Potential and Developed Water-Power of Some Leading Countries (1955)

Note that the United States leads the world in the production of hydro-electricity. Italy, France, Sweden, Switzerland, Germany, and Norway account for more than half of Europe's developed power. Norway leads the world in developed water-power on the basis of *per capita* production. Note the position of India in potential and developed water-power.

since then and stood fourth in the year 1961. The mountains on the southern border in Central Asia, Kazakastan, Siberia, and the Far East are regions rich in sources of water-power. Caucasus is the main source of water-power in the European portion of the Soviet Union. The power station at Dnepropetrovsk on Dnieper is one of the biggest in the world. The Volga, Yenesi, and other Siberian rivers are also being harnessed. Cold winters and low density of population are the main handicaps holding up the full utilization of the rich water-power resources of the Soviet Union.

Italy comes next in order, with large water-power resources around the densely populated and industrialized Po Basin. Both the Alps in the north and the northern Apennines in the south offer ample sources for water-power. Absence of coal has served as an incentive for the development of hydro-electricity.

France follows Italy very closely in the production of hydel-power. Its major sources lie on the flanks of the Vosges, the Alps, the Pyrenees, and along the rim of the Central Plateau.

Sweden is favourably placed in so far as her potential water-power is concerned. A large number of lakes serve as natural reservoirs regulating the flow of its streams. Severe winters, however, are a handicap to the development of these resources. But the lack of coal has encouraged the harnessing of water-power which is responsible for the high standard of living in this small country.

Norway claims the highest *per capita* production of hydro-electricity in the world. Heavy precipitation, mountainous and glaciated topography, mild winters along the coast, and heavy snow in the uplands enable it to produce abundant hydel-power at low cost. This is the secret of the growth of her industries and the high standard of living of her people.

Switzerland is yet another European country with rich water-power resources, both potential as well as developed. The Alpine streams, lakes, glaciers and waterfalls in the hanging valleys, coupled with the absence of coal has encouraged this small country to make the best use of its rich potential water-power.

Brazil enjoys a distinct leadership in potential water-power with 32 per cent of the total potential of the South American continent and 61 per cent of its developed water-power.

The Congo leads the world in potential water-power, although it now stands very low in developed water-power. It exceeds the combined potential water-power resources of Europe and South America.

India has vast hydel-power resources, more than forty million kilowatts. In terms of horsepower energy it is calculated to be about 27 million horsepower. Thus it stands only next to Congo, the Soviet Union, Canada and the United States.

The bulk of its potential water-power resources lie in the Himalayan region. The seasonal and rather undependable nature of rainfall, particularly outside the Himalayan region, is a great handicap in the economic development of its water-power resources.

South India, perhaps owing to its paucity of mineral fuels, was the first to recognize the importance of harnessing its water resources. Sivasamudram Project on the Cauveri in Mysore constructed in 1902, was the first project of any magnitude not only in India but in the whole of Asia. This was followed by the Tata hydro-electric schemes of Bombay and Pykara in Madras.

The Mandi Power House was the first in the Himalayan region and this was followed by the Upper Ganges Canal Hydro-electric Grid System.

The Bhakra-Nangal, the Hirakud, the Damodar Valley, the Koyna, the Rihand, and the Sharawati are some of the important power projects recently undertaken and are in various stages of completion. River projects in India are generally multi-purpose projects seeking to achieve power production, irrigation, flood-control, navigation, industrial development, and other ends. (*See* picture 52.)

The coal and petroleum reserves of India are inadequate to meet the requirements of the industrial development of the country and hence the need for the development of hydel-power. The development of water-power will, however, depend on the availability of vast capital to be invested and the progress in demand from the developing industries of the country.

ATOMIC ENERGY

Scientists are trying to put to peaceful and industrial use the tremendous energy made available by splitting the atom. *Radioactive* elements like *uranium* and *thorium* are used for this purpose.

Canada has large deposits of Uranium near the Great Bear Lake. The United States has Uranium in Colorado and thorium in the Columbia basin. The Soviet Union has uranium deposits in Central Asia, Siberia, and the regions around Lake Baikal. The Katanga province of Congo and Johannesburg in South Africa have uranium. Australia has uranium near Port Darwin. Czechoslovakia also has some uranium deposits.

The Malabar coast of India has *monazite* sands which yield thorium. India has considerable uranium deposits in Bihar.

The Soviet Union, the United States, the United Kingdom, France, Canada, India, China, and Japan have established stations to generate atomic energy.

Relative Significance of Major Sources of Power

Today, various sources of power are being used to meet the ever-growing demand for energy from industries and small consumers. The classification of energy consumed in the world in 1958, in terms of millions of metric tons of coal equivalent, is as follows:

Coal	2,002
Petroleum	1,205
Natural Gas	507
Hydro-electricity	75
Total	3,789

The figures clearly indicate that the industrialized world operates largely on a two-fuel economy, coal and oil contributing some 85 per cent of total production. In North America, where hydel-power and natural gas deposits are well developed, the coal and oil account for 65 per cent of the total energy produced. In Western Europe where potential water-power has been developed to the maximum, the contribution of coal is over 80 per cent of the total. (*See* Appendix I.)

Each of these power resources, however, has its own advantages and disadvantages. The cost of transport of coal is high as compared to the cost of transport of other raw materials. Therefore, generally the raw materials are taken to the coal-fields, with the result that industries and industrial towns develop on, or near the coal-fields.

Petroleum and electricity, on the other hand, can be carried with relative ease by pipelines and wires respectively over comparatively long distances. In recent times, there has been an increasing tendency to use either oil or electricity in lieu of coal and hence the recent development of industries is found away from the areas of production of power resources, if other factors are more favourable.

There is, of course, large scope for increasing hydro-electricity, particularly in the continents of Africa, Asia, and South America. This source of power will continue to play an important role in the future because of its inexhaustible nature. The production of hydro-electricity, however, requires considerable initial investment and certain geographic conditions like favourable topography, an equable rainfall regime and natural or artificial water reservoirs ensuring continuous water supply and a high head of water.

As coal was the first and still is the foremost source of industrial power, coal-producing nations like Great Britain, Germany, the United States and the Soviet Union are in the forefront of industrial progress. They would continue to remain so for a long time to come. In recent years, China is also making a serious bid to overtake these countries.

EXERCISES

Review Questions

1. Answer the following questions as precisely as you can :
    - *i*) In what way were the mineral resources used by early man?
    - *ii*) To what extent was the search for minerals responsible for the discovery, explorations and settlement of unknown parts of the world? Give specific examples.
    - *iii*) What are the other factors responsible for the increasing consumption of iron besides its abundance and the low cost of production?
    - *iv*) In how many different ways is electricity produced?
    - *v*) Name the various natural sources of energy.
    - *vi*) What are the three major sources of power in the order of their consumption?
    - *vii*) Name the principal ores of iron giving the range of iron content in each.
    - *viii*) Explain what is natural gas and state its industrial and domestic uses.

2. Give reasons :
    - *i*) Coal is called 'black gold'.
    - *ii*) Water not used is water wasted.

iii) Bulk of the world's bauxite reserves are located in the tropics.
iv) A large number of industrialized nations import mica and manganese.
v) For centuries, gold has promoted international trade.
vi) Production of iron and steel is an index of the country's defence potential.
vii) Production of mineral oil is a critical factor for any country, both in peace and war.

3. Compare and contrast :
   i) Minerals and mineral-ores.
   ii) Open-pit mining and shaft mining.
   iii) Tin lodes and tin gravels.
   iv) Peat and anthracite.
   v) Potential and developed water-power.
   vi) Off-shore and inland drilling.

4. Describe briefly the important methods of mining and drilling with special reference to iron, coal, tin, gold, and oil.
5. What are the comparative advantages and disadvantages of coal, petroleum, and water as sources of industrial power?

6. Discuss systematically various geographical factors which are essential for the development of hydel-power? Illustrate your answer with specific examples from different continents.

7. Give a brief account of the oil resources of the world, bringing out clearly the regions that are deficient in oil and those having sizable surplus for export. In what way is the Suez Canal related to the trade in oil?

8. Make a comparative study of iron and coal reserves and their distribution in the United States and the Soviet Union, or in China and India.

9. Fill in the blanks with appropriate words:
   i) Metallic minerals are generally . associated with————and ————rocks, whereas the non-metallic minerals are found in ————rocks.
   ii) Bauxite contains hydrated————oxides.
   iii) ————is a very good conductor of electricity, next only to———.
   iv) ————resists corrosion and is commonly used for————thin sheets of steel.
   v) ————is a non-conductor of electricity and is specially used in electrical goods.
   vi) ————is a metal that is not oxidized.

10. Use a single technical term for each of the following statements :
    i) A metal in its raw state as extracted from the earth.
    ii) An open air excavation in the earth's crust from which stone or building rocks are obtained by cutting, blasting, etc.

iii) Pig-iron from which carbon is removed.

iv) Brown coal containing about 40 per cent carbon and considerable amount of moisture.

v) Coal used by ships.

11. Complete the following table with appropriate and pointed information under each column: (A few columns have been filled to serve as examples.)

Name of the mineral	*Mineral ore from which it is extracted*	*Striking properties of economic and industrial significance*	*Leading producer*	*Leading exporter*
Iron	Haematite Magnetite Limonite			
Copper				
Gold		malleability and ductility a medium of international exchange		
Aluminum				
Manganese				
Tin				Malaysia
Mica			India	

12. Given below is a poem written in the 19th Century. Read it carefully and answer the following questions :

i) Which of the facts in this poem are true even today?

ii) Which characteristic of each metal was in the mind of the poet while composing the poem?

iii) What changes will you suggest to make the poem applicable to the present day conditions?

Gold is for the lady
Silver for the maid
Copper for the craftsman
Cunning at his trade
"Good" said the baron
Sitting in his hall
"Iron, cold iron,
Is the master of all".

Finding Out

i) Read the following statement carefully and collect some statistical data and other information to verify its authenticity.

"The emancipation of man from the toil and inefficiency of earlier ages and the attainment of high *per capita* productivity today, are in direct proportion to the growing and efficient use of power."

ii) Experiments are going on to determine the practicability of liquefying coal and also of converting coal into gas at the mines. If the experiments become a commercial reality, what in your opinion would be its effect on location of industries?

iii) Conservation of minerals is as important as the conservation of soil and water. Find out what different steps have been taken by the Government of India in this regard.

Cartographic Work

Collect the statistical data for the following, for the years 1948, 1950, 1955, 1960, and 1965, and show graphically the growth in the production of power in India since independence :

i) Production of coal;

ii) Installed capacity to produce electricity;

iii) Production of oil.

Write a suitable note on the graphs made by you.

Picture Reading

i) Compare the different methods of mining and drilling as seen in pictures 45, 46, 47, 49 and 51.

ii) See the picture of Bhakra Dam. Why do you think this particular site was chosen for constructing the dam and erecting giant power houses?

Films Available

i. Quest for Minerals. No. 622.33; 10 mins; Hindi; D.A.V.E.
ii. Iron from the North. 20 mins; English; C.H.C.
iii. A Story of Copper. 30 mins; English; U.S.I.S.
iv. Tin from Malaya. No. 152; 20 mins; English; M.H.C
v. Made from Mica. No. 554.9; 9 mins; Hindi/English; D.A.V.E.
vi. Gold. 11 mins; English; C.H.C.
vii. Peat and Coal. No. 622.33; 9 mins; English; D.A.V.E.
viii. Lignite. No. 622.33; 13 mins; Hindi; D.A.V.E.
ix. The Digboi Story. No. 655.53; 25 mins; Hindi; D.A.V.E.

x. 10,000 Feet Deep. No. 622.23; 11 mins; English; D.A.V.E.

xi. River of Hope. No. 627.8; 11 mins; Hindi/English; D.A.V.E.

xii. Rivers in Harness. No. 627.8; 11 mins; Hindi/English; D.A.V.E.

xiii. Atomic Power Station Kahl. No. 265; 13 mins; English; Embassy of the Federal Republic of Germany.

xiv. Industrial Power. No. 1; 25 mins; English; J.I.C.

xv. Our Common Fuels. No. 662.6; 11 mins; English; D.A.V.E.

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CHAPTER 7

Industries

AGRICULTURE helps to raise crops and animal husbandry to better the production of meat and dairy products. Useful minerals are extracted from the bowels of the earth through mining. Many of these products, however, cannot be directly utilized by man without being processed. These processes are a part of organized human effort known as industries. The word *industry* generally implies systematic production characterized by division of labour and extensive use of machinery.

Many relatively simple processes such as weaving, metal work and carpentry were formerly carried out with simple tools such as a loom, a spinning wheel, a hammer or a chisel. The use of these tools saved time and energy. In fact, these tools as well as the pulley, lever, and the potter's wheel represented the earliest beginnings of the more elaborate and powerful machines of today.

Man used his own muscle power to use these tools. Gradually he began to use animal power, as well as wind and water-power. This system still prevails in rural areas in many countries including India.

The various processes have been continually improved and new processes adopted to produce a variety of goods used by man. In modern times, these processes are carried out by the large establishments using improved tools and methods. Steam and electric power has replaced the simple muscle power of the past, and as a result, factory towns and big manufacturing centres have come into existence.

Manufacturing centres flourish well when carefully planned. They depend on the availability of power, raw materials, labour, capital, and marketing and transport facilities. They become ideal sites when all these are readily available which, of course, is a rare thing. In many areas it is found that the industries are located where abundant power is available; for example, the industries located on or around coal-fields, or near the big hydel-power centres. On the other hand, several industries are located where the raw materials required are at hand. For example, sugar mills are located not far from the farms producing sugar-cane or sugar-beet.

The rapid growth of industries became possible owing to the revolutionary invention of the steam engine by James Watt. This engine gave a fillip to the mining industry.

Steam has been the motive force for working heavy machinery. To begin with, wood and charcoal were used as fuel to obtain steam from water. Later, it was discovered that coal was a far more effective and economic fuel than wood or charcoal as it gave out a great amount of heat. The use of coal as a fuel for steam engine thus further contributed to the rapid growth of industries.

The machines saved labour and did more work in less time. Consequently the *output*, that is the work turned out, was comparatively much more than it had been by previous methods. Moreover, the human labour thus saved could be used to work more machines and increase the ouput still further. The highly complicated machines of today call for skilled and efficient labour. In fact, high wages of such skilled labour prove economic, because of their high productivity.

Where factories were set up, a large number of workers turned out great quantities of goods. Merchants came forward to sell the goods both in near and distant markets. This meant that the goods had to be transported and vast quantities of raw materials had to be collected from different areas to be made into finished goods in factories and then transported to the four corners of the world for distribution through sale.

This change in the field of production from hand-operated tools to power-driven machinery, is known as *Industrial Revolution*. Factory towns and manufacturing centres sprang up where a great number of workers lived together. New problems of crowded localities or slums and of relations between workers and management began to crop up.

The Industrial Revolution first took place in Great Britain; from where it spread to the rest of Western Europe and thence to colonial America. Today it embraces the whole world. With the discovery of other power resources like petroleum and water-power, big industrial centres have come into being and several labour-saving devices have been introduced.

Auto-machines, that is, machines doing the work of hundreds of workers automatically, are being used increasingly. This has led to an unprecedented growth in production. Currently a country like the United States is undergoing yet another advanced phase of industrial revolution known as *automation*.

TEXTILE INDUSTRIES

For centuries, wool, silk, cotton, flax, and jute have been used for making cloth. During the last two hundred years, cotton, woollen, silk, and other textile mills have been established and their number is growing steadily in different parts of the world. Machine-made cloth has now become very common, although hand-made cloth is also important in some countries like India.

Cotton Textiles

This industry owes its origin and rapid development to a series of inventions made

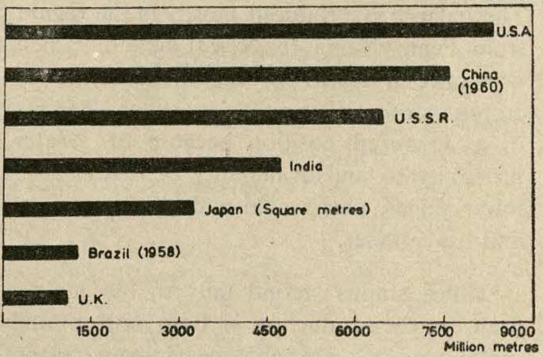

Fig. 46. Production of Woven Cotton Fabrics (1961)

Before World War I, the United Kingdom led the world in the production of cotton textiles accounting for three-fifths of the value of the cotton piecegoods that entered the world trade. Now, as many as six countries have overtaken it in production. What single factor is responsible for bringing about this change? Name the exception, if any.

in England in the latter half of the eighteenth century. Kay's Flying Shuttle was invented in 1733 in order to weave wide cloth quickly. It was followed by a carding machine in 1760, Arkwright's spinning jenny in 1767, Crompton's mule spinner in 1779, all of which made spinning easy and quick. Cartwright's power loom run by water-power and the steam engine came to be used first in 1785. Bell's cylinder printer for calico printing was invented in the same year. Equally important were the inventions of Whitney's cotton gin (1793) and Jacquard's loom (1801) for making complex patterns. In short, an invention speeding up one process of manufacturing called for development in other allied-processes.

Principal Manufacturing Regions

The United States today is the largest producer of cotton textiles. It is at present the third largest exporter of cotton textiles, next only to Japan and India (Fig. 46).

About two-thirds of its cotton textiles are manufactured in Virginia, the North and South Carolinas, Georgia, and Alabama. The balance is produced mostly in the region from Pennsylvania to New England, which was once a leader in the manufacture of cotton goods. The southern states are now in a favoured position because of greater proximity to and availability of raw cotton, lower wages, cheap coal and electric power, and lower taxes.

China stands second only to the United States in the production of both cotton and cotton goods. Shanghai is its main cotton textiles centre. The industry grew here when it was a foreign-controlled port. It utilized imported coal, and local and imported cotton. The other important centres are Tientsin, Tsingtao, and Hankow. These are all ports close to cotton-producing area. The new cotton mills are now set up in Manchuria and North China. China has a very large internal market for its cotton goods. It also exports some of its cotton piece goods.

The Soviet Union has an old cotton textile industry most of it in the central districts around Moscow and Ivanovo-Vosnesensk. In order to reduce transport costs and spread industry in different parts, it has now built mills in the cotton-producing areas of Central Asia, the Caucasus and Western Siberia, Kuznetsk, and the Ukraine. The availability of cotton, hydel-power, coal, local market, and rail and water transport have helped this growth.

India has a glorious tradition of producing superb cotton textiles. Before the British rule, Indian hand-spun and hand-woven cloth had a wide and sure market all over the world. Indian handloom fabrics earned high esteem in all foreign lands.

The British tried to suppress Indian skill in spinning and weaving but they met with only partial success. This partly explains why hand-spinning and hand weaving was given a place of honour in the national struggle for political freedom.

A large number of handlooms, supplemented recently by power-looms, are working at innumerable small centres and these still produce a large percentage (about 30 per cent) of Indian textiles. Over a million handlooms are working in the country. The estimated output of Indian textile mills at the end of 1966 was 5,800 million metres of cloth annually and handlooms would account for some 3,500 million metres.

Bombay is the oldest centre of our modern cotton textile industry. The first cotton mill in that city was established in 1854. In those early days, the Civil War in America and the opening of the Suez Canal contributed to the quick development of the industry in India in general, and in Bombay in particular.

The warm, moist climate of Bombay, an excellent port for importing machinery, coal and long staple cotton, easy access to the cotton-growing areas of Maharashtra and Gujarat, cheap and skilled labour from the Konkan and Desh regions of Maharashtra, the enterprising Parsi, and Gujarati communities, and a vast local market soon resulted in a rapid expansion of the industry in that region. The development of hydro-electricity later gave a further fillip to the industry at Bombay.

Today, Bombay city with its sixty cotton mills has over 60,000 looms and 3,200,000 spindles. Many of these are only spinning mills which supply yarn to the weaving mills,

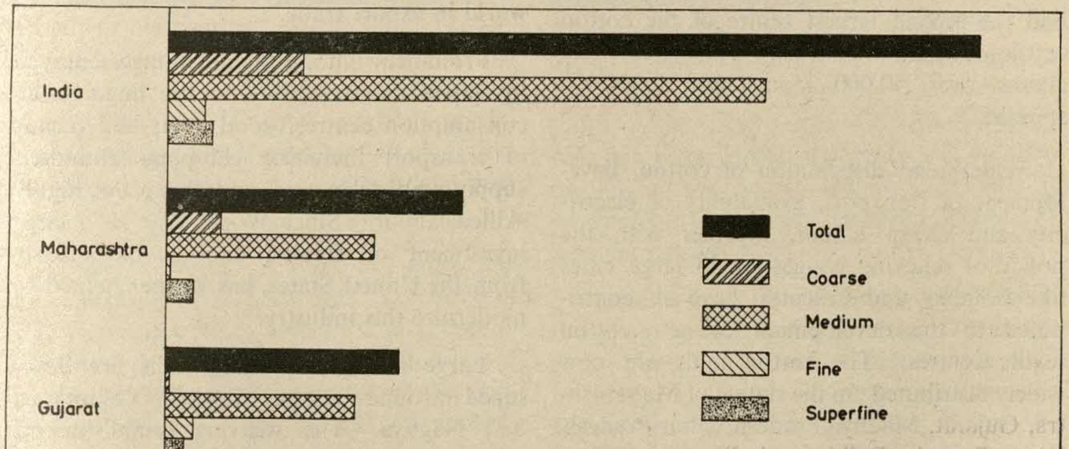

Fig. 47. Production of Mill Cotton Piecegoods in India (1962)

Study carefully this diagram and write a brief note on cotton textile industry in Maharashtra, Gujarat, Madras and Delhi, highlightning the special feature of production in each case.

or to the small handloom and power-loom establishments. (*See* picture 55.)

Ahmedabad on the Sabarmati is another old centre of cotton textiles. The first mill was started here in 1859. This centre is situated in the heart of a cotton-growing area. Besides the availability of raw material in the immediate vicinity and the skill of the local weavers, it is the enterprise of the business community which has made Ahmedabad the second largest centre of the cotton textile industry in India. Today, the city claims over 40,000 looms and 2,000,000 spindles.

Widespread distribution of cotton, development of transport, availability of electricity and cheap labour, together with the policy of relieving congestion in large cities like Bombay and Calcutta, have all contributed to the development of new cotton textile centres. The cotton mills are now widely distributed in the states of Maharashtra, Gujarat, Madhya Pradesh, Uttar Pradesh, West Bengal, Delhi, and Madras. There are some mills in Mysore, Punjab, Rajasthan, Pondicherry, Orissa, Andhra Pradesh, and Kerala (Fig. 47).

Mills in India have to import long staple cotton from the United States, the United Arab Republic, the Sudan, East Africa, and Pakistan. But recently production of long staple cotton in India has substantially increased, so that India now imports only 12 per cent of its total mill consumption of cotton as against 35 per cent in 1950.

Export of cotton textiles is vital to Indian economy. India is the second biggest exporter of cotton textiles, Japan occupying the first place. The United Kingdom, the Sudan, Indonesia, Kenya, Nigeria, Australia, Aden, Singapore, Ceylon, Burma, and Pakistan are the main importers of Indian cotton textiles. Asia and Africa, where coarser varieties of cloth are used, are potential markets for Indian cotton goods. Today, China is the main competitor with India in a large number of foreign markets.

Japan is an important producer of cotton textiles. Raw cotton accounts for about 30 per cent of its imports, coming mostly from the United States, China and India. Similarly, more than 30 per cent of its exports are finished cotton goods, leading the world in export trade.

Prominent among the advantages enjoyed by Japan are proximity to the huge Asian consumption centres, good ports and means of transport including shipping, abundant supply of hydel-power, and cheap but highly skilled labour. Since World War II, a large investment of foreign capital, particularly from the United States, has further helped to modernize this industry.

Large modern spinning mills are developed around Osaka, Tokyo, Yokohama, and Nagoya. The weaving establishments are small in size but great in number and are spread over a large area. Osaka, in the southern Honshu, is known as the "Manchester of Japan". (*See* pictures 53 and 57.)

Brazil was a large market for foreign cotton goods only thirty years ago. Today, it not only meets its own requirements but also provides large quantities of piecegoods for export. The cotton mills are located in the States of Sao Paulo, Minas Geraes and Rio de Janeiro and along the coast. Brazil is yet another example which indicates that the modern cotton textile industry has a tendency to move towards cotton-producing and consuming regions.

The United Kingdom, particularly Lancashire, led the world in cotton textile industry for over one hundred years. It developed most of the textile machines which subsequently spread to other parts of the world. This region with Manchester as the centre was well served with streams that provided power as well as the pure water needed for bleaching, dyeing, and printing. Salt deposits and chemicals developed in the region was yet another asset for carrying out these processes. Coal was also not far from the region. Humid air facilitated weaving and spinning. The construction of the Manchestership Canal enabled an interior city like Manchester to become a port and helped in importing cotton and exporting finished goods. Skilled labour was also available in an abundant measure. The country had an assured market in its dependencies, colonies and dominions, where it could buy raw cotton and sell finished goods.

Today, however, it does not enjoy the same position as it once did. Competition from countries like Japan, China, India, and Brazil in the production of cotton goods has forced the Lancashire industry to specialize in high-grade fabrics and specialities. In 1959-60 the industry was reorganized. About 400 old-fashioned mills were shut down and the number of spindles and looms was reduced to half. The modern machinery was installed in other mills and the industry is again showing signs of prosperity to some extent.

In recent years the cotton textile industry has shown a tendency to migrate from the temperate regions of Europe and America to warmer cotton growing areas where cheap skilled labour, cheap power, new automatic machinery, and huge local markets, particularly for coarser varieties of cloth, are readily available.

Woollen Textiles

Woollen manufacturing industry is much older than cotton textiles since woollen fabrics have been in use for a longer time. Woollen fabrics are used in most parts of the world, and they are essential in cold climates.

A plentiful supply of clean and soft water, raw wool preferably of different varieties, skilled labour, industrial power, and nearness to market are the main factors that encourage the woollen textile industry.

The Soviet Union is the world's largest producer of woollen fabrics. There are woollen mills in a large number of districts. Among the old centres of production are Moscow and Leningrad, whereas Kremenchug and Kharkov in the Ukraine, Kutaisis in the south of the Caucasus, and Kazak in Soviet Asia are some of the new centres of woollen textiles in the Soviet Union. In 1961, it produced 355 million square metres of woollen fabrics.

Japan is one of the leading woollen manufacturing countries of the world. As in the case of cotton, it has to import raw wool in order to export woollen piece goods. Japan has wool-manufacturing centres in Osaka-Kobe and Tokyo-Yokohama areas. It produced 340 million square metres of woollen fabrics in 1961.

The United Kingdom has its major woollen textile industry in the West Riding of Yorkshire, east of the Pennines. Bradford and Leeds are the important centres in this area. The Tweed Valley and South-West England are the other areas with woollen textile industry. In 1961, the country. produced 294 million square metres of woollen fabrics.

The United States has its major woollen textile industry located in a belt east of the Appalachians and north of Washington, D.C. Philadelphia is a centre best known for its carpets. The important mill centre, however, is Boston in New England. This area accounts for nearly three-fifths of the total national output. The Middle Atlantic States produce nearly a quarter of the woollen textiles. The United States produced 262 million square metres of woollen fabrics in the year 1961.

The other important countries that produce sizable quantities of woollen textiles are Italy, France, West Germany, Poland, East Germany, and Czechoslovakia. All these are European countries, where the cool, damp climate makes woollen garments a necessity for every human being. The dense population provides a ready market. Skilled labour and availability of coal and water power have helped the industry to grow rapidly. Rail and inland water transport, and easy access to sea for the import of raw wool in addition to local supplies have all contributed to the expansion of the industry.

India has a woollen textile industry of its own which meets the local demand. However, the industry is not as important as cotton textiles. The local wool supplies are far from being adequate and are supplemented by imports of raw wool, mainly from Australia.

Handlooms are as important in the woollen manufacturing industry as in the cotton. The *kambal* is symbolic of the Indian farmer almost all over India. The woollen textile industry has been developed fairly recently with the establishment of mills at Dhariwal and Kanpur in 1876.

There are about 300 organized woollen units in all. Of these 36 are purely spinning units and 30 composite ones. The total number of spindles is slightly less than 200,000. The installed capacity of the mills is enough to produce 43 million metres of woollen fabrics. In 1962, the mills actually produced 18.29 million metres of woollen and worsted fabrics.

India produces woollen yarn, piecegoods, blankets, shawls, shoddy cloth hosiery and carpets. Some of the goods are exported to the Soviet Union, the United Kingdom, the United States, Canada, and Australia. There is a growing demand for Indian goods.

The Punjab occupies a dominant position in the woollen textiles with 25 mills located at centres like Dhariwal, Amritsar, and Ludhiana. Maharashtra with 10 mills comes next in order. The rest of the mills are scattered all over the country.

Silk Textiles

China is the ancient home of silk. Japan, Korea and India have also been producing silk for hundreds of years. Hand-made fabrics of excellent quality used to be exported from these Oriental countries. Silk, these days, is very often referred to as a "fallen queen" owing to the inroads made by synthetic fibres on its domain.

Rearing of silkworms and reeling of silk thread from cocoons are household industries requiring skill. In Eastern countries much more silk is woven on handlooms than is done in modern factories, although they produce less than a fourth of the world's machine-made silk.

Japan is the largest producer of raw silk and accounts for nearly two-thirds of the world's produce. About 80 per cent of the raw silk entering into world trade comes from Japan. Central and Southern Japan, particularly the Ise Bay or Nagoya industrial region, is well-known for the reeling of silk. The silk industry of Japan still tops the world as far as high-grade silk goods are concerned, because of its matchless techniques in mixed weaving and dyeing processes.

China the second largest producer of raw silk, produces only one-third of what the Japanese do. The silk industry is centred in the Lower Yangtze and Si-Kiang valleys. The Government is encouraging silk exports with a view to challenging the Japanese monopoly in the trade.

The Soviet Union has its silk textile industry in the old centres of Moscow Oblast and Ivanavo Oblast. The old centres of silk reeling were in Azerbaidzhan and Uzbekistan. New silk reeling factories have been built in Georgian S.S.R., Turkmen S.S.R., Kirghiz S.S.R., and the Uzbek S.S.R. In fact, the one at Margelan is the largest in Europe.

In **Europe**, the important manufacturers of silk are Italy and France. The towns in the Po Valley and along the foot of the Alps are important centres. Milan is the leading silk textile centre of Italy.

In **France**, Lyons is a commercial centre of silk trade. Silk industry is located mostly in the south-east part of the country. (*See* picture 54.)

These two, along with a few other European countries, together produce nearly a third of the modern silk manufactures of the world. Highly skilled and relatively cheap female labour, cheap power, production of some raw silk, ease in import and distribution of raw silk, large local markets, protective tariffs, and development of other allied and related industries are the favourable factors in this regard.

The United States developed its silk industry on raw silk imported from Japan. New York is the main silk market. The manufacturing districts are the valleys of Eastern Pennsylvania, Northern New Jersey, and the mill towns of Sotuh-Eastern New York State and Southern New England region. The factors favouring the industry are mostly the same as in Europe.

India has a fairly large sericulture and silk industry providing part or full employment to about 2.8 million people. Locally produced raw silk is consumed by handlooms to the tune of about 90 per cent. India produces different varieties of silk, mulberry and tussore (tasar) being the main types. Mysore, West Bengal, Assam, Madhya Pradesh, Bihar, and Jammu and Kashmir are the major silk-producing States in India.

There are about 90 silk factories in India but only a few in Bengal, Mysore, and Maharashtra are power driven. The chief silk weaving centres are Srinagar in Kashmir, Amritsar and Jullundur in the Punjab, Varanasi, Shahajahanpur, and Mirzapur in Uttar Pradesh, Bhagalpur in Bihar, Bishnupur and Bankura in West Bengal, Kamrup and Shillong in Assam, Berhampur in Orissa, Nagpur, Sholapur and Poona in Maharashtra, Ahmedabad in Gujarat, Bangalore in Mysore, and Kanchipuram in Madras.

Ceylon, Singapore, Hong Kong, Malayasia, East Africa, America, and the European countries are markets for Indian silk fabrics. In 1960-61, India exported 590,000 metres of silk fabrics worth Rs. 6,000,000.

Rayon Textiles

Besides animal fibres, like wool and silk, and plant fibres like cotton and jute, man-made fibres have been newly developed. These fibres, *viz.*, rayon, nylon, terylene, and dacron, collectively known as synthetic fibres are being increasingly used. Rayon fibre, which is now widely used, is made by a chemical process from wood and pulp, whereas nylon is made from coal, and terylene from oil.

Rayon was first developed in European countries in 1913. The industry gradually developed first in Europe and then in the United States, Japan, and other parts of the world. Rayon is now fast becoming an important textile product and has already displaced silk in many fields.

Cellulose obtained from wood or cotton linters is treated with chemicals and the viscous mass produced is forced through minute holes in glass plates producing silk filaments. The filaments are then twisted into yarn which, in turn, is woven into fabric (Fig. 48).

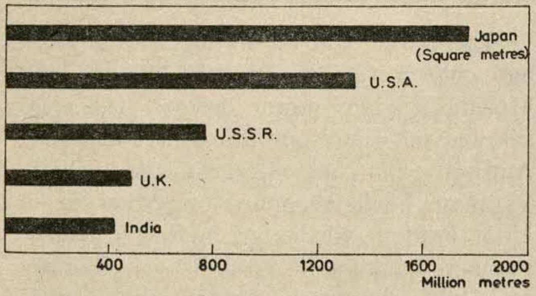

Fig. 48. Production of Woven Rayon and Acetate Fabrics (1961)

Although Japan has to import raw materials, namely wood-pulp and cotton linters, the cost of its rayon fabrics is low mainly due to cheap labour, power, and chemicals. How far do the production figures support this contention?

Japan is the largest producer of rayon. Its industry is located in the central parts of Honshu, where cheap labour, abundant power, and chemicals are readily available. Wood-pulp is obtained from Canada, the United States, Norway, and Sweden. Cotton linters are imported from India, China and other countries. Besides its large home market, it has captured markets in Asia and other parts of the world. (*See* picture 56.)

The United States has practically switched on from its silk weaving industry to rayon and other artificial fibres. The industry is located in Southern Piedmont and New England, the large centres being mainly in New Jersey and Pennsylvania. The silk and synthetic textile industry is known as a 'parasitic' industry in this country as it prefers its location near other industries and employs mostly the female labour which is readily available here on economic terms. The output per head of labour is generally several times higher in rayon fabrics than in the silk-weaving.

The Soviet Union is the third among the leading producers of synthetic textiles, especially rayon. Klin, Mogilev, and Leningrad are important centres.

The United Kingdom was producing nearly half the world's rayon before World War II. The recent reorganization of its cotton textile industry has encouraged many of the old cotton mills to switch on to rayon and other synthetic fabrics. The industry is located mostly in Lancashire, where cheap female labour and old skill and experience in textile industry are readily available. Although wood-pulp is imported from the North European countries, its cost is relatively a small part of the total cost of the finished product.

India began rayon weaving in 1931, but the manufacture of rayon began in 1946. Weaving is concentrated in Bombay, Ahmedabad, Surat, Calcutta, Amritsar, and Gwalior. Rayon yarn is manufactured at Rayonpuram in Kerala, Bombay in Maharashtra, Kotah in Rajasthan, and Hyderabad in Andhra Pradesh. 35,000 power-looms and 75,000 hand-looms weave rayon -fabrics in India.

Bamboo and some other grasses and cotton and cotton-waste can produce the necessary pulp; chemicals are available in India, and ample river water is also at hand. So rayon manufacture has good prospects in India. However, rayon, in its turn, has to face competition from nylon and other synthetic fibres and fabrics.

Jute Textiles

The raw materials of the linen industry are flax, hemp and jute of which jute is the most important. The Indian sub-continent holds the monopoly both in the production of raw jute and to a large extent in jute textile products.

Whereas East Pakistan is more favourably placed for the production of raw jute, India enjoys a big lead in the production of jute piecegoods, mostly as a result of the early momentum.

The jute industry plays a vital role in Indian economy as it is the principal earner of foreign exchange accounting for nearly a fifth of the total export earnings. In 1962, there were 109 mills in the country and the total number of looms was over 72,000, that is about 57 per cent of the total capacity of the world (Fig. 49).

Of the 109 mills in India, as many as 98 are concentrated in West Bengal, most of them being in the metropolitan centre of Calcutta. The city enjoys a unique position as an efficient Centre for the collection and distribution of raw jute and finished jute products, as it is well-served by railways, river channels and by a port of international importance.

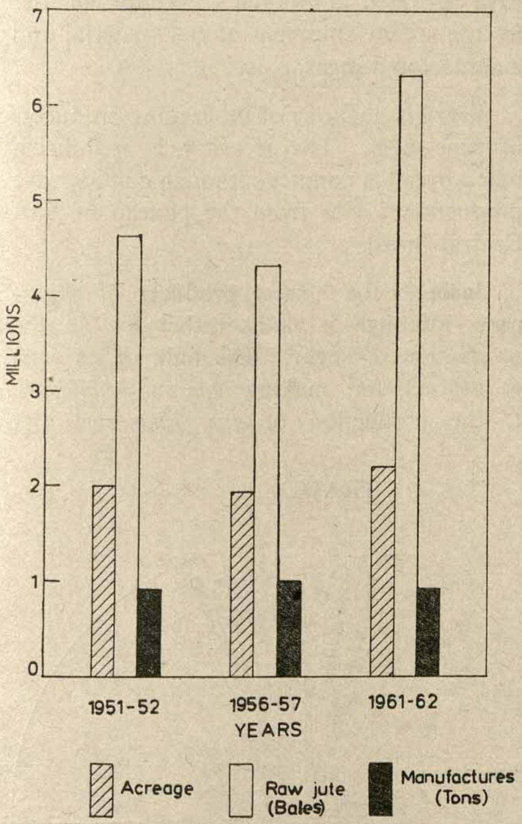

Fig. 49. Progress of Jute Industry in India since 1950

The supply of jute and mesta in 1961-62 was about 9.3 million bales of which 8 million were locally produced. The jute yield per acre in 1961-62 was 1110 lbs. What fact strikes you most about the data represented in this diagram?

The annual production of jute textiles is more than a million tons. The industry now relies more and more on local jute supplies as they are being increased to meet the demands of Indian jute mills. The industry is also alive to the need for diversification of its products—cotton bagging, carpet backing, tarpaulins, paper-lined hessian, jute carpets and jute webbing. This is necessary in order to maintain its dominant position in world trade.

Pakistan is the other important country in the world jute trade. It is also now establishing jute mills to develop its own textile industry. A considerable amount of raw jute from Pakistan is consumed by Indian jute mills.

There are also jute mills in the United Kingdom, France, Brazil, Belgium, Italy and in a few other places in the world.

Sugar Industry

Sugar is an important article of food with a universal demand. Sugar industry, however, is confined to two regions—the humid tropical and the temperate lands. Whereas the former regions have a cane-sugar industry, the latter specialize in beet-sugar.

Of the two, the cost of production of cane-sugar is generally low because of its higher yield per acre. Beet-sugar is generally confined to local markets and needs protective measures in order to compete with cane-sugar. Beet-sugar, therefore, hardly enters international trade.

Sugar mills are located in the vicinity of cane or beet farms. It further requires quick and efficient means of transport for the speedy delivery of its bulky and perishable raw materials. The industry needs large investment in costly machinery and has to employ highly skilled technical personnel. Science and technology have played a considerable part in increasing the yield of both cane- and beet-sugar. (*See* picture 58.)

Cuba, the largest producer and exporter of sugar, depends almost entirely on the sugar industry for its prosperity. It is in a position to devote about 50 per cent of its cultivated land to sugar-cane alone, as the island has to support a comparatively small population (Fig. 50).

Cuba harvests 4 to 8 crops from one planting. These crops except the first are called *ratoons*. The sugar-cane plantations are generally not far from the sea. This reduces transport difficulties to the minimum. The main market for Cuban sugar had been the United States, which is very close to Cuba. This market is now closed to Cuba because of some recent political developments. The other market of North-West Europe is not very far.

The Soviet Union is the leading producer of beet-sugar, standing next only to Cuba, the producer of cane-sugar. In spite of the large production, she has to import considerable quantities of refined sugar to meet the local demand.

The industry is widely distributed in the beet-producing regions of the Ukraine. New factories have been built in Kirghizia, Kazakhstan, North Caucasus, Georgia, the Volga region, Western Siberia and the Far East.

Under the new plans the Government have provided additional transport facilities for the speedy shipment of raw material and manufactured sugar.

Brazil is now one of the leading producers of cane-sugar. The industry is well-distributed over the country although considerable production comes from the plateau of East Central Brazil.

India is the largest producer of sugar-cane, although it ranks rather low in the production of sugar. The bulk of its cane is utilized for making *gur* and *khandsari*. If the production of *gur, khandsari* and

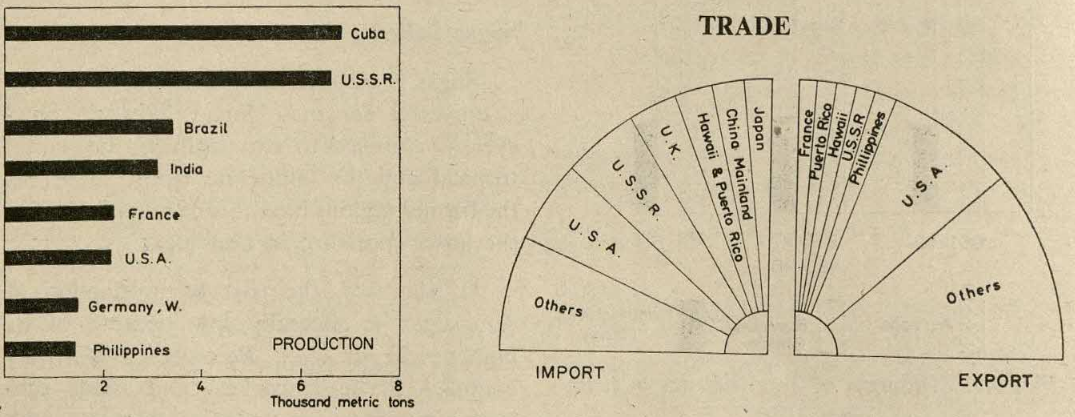

Fig. 50. Production and Trade of Sugar (1961)

Of the total world produce of sugar, nearly two-fifths enter the world trade. Of this as much as nine-tenths is cane-sugar. Compare the sugar industry of Cuba with that of India and explain why Cuba has felt keenly the fluctuations of sugar prices in the world market.

factory sugar is taken together, India stands first in world production. Out of about 100 million tons of sugar-cane produced, only 27 million tons of cane was crushed by the sugar mills in 1961-62. The rest was used for the production of *gur* and *khandsari* by indigenous methods.

The sugar industry in India is second only to its cotton textile industry. There were 179 sugar mills in the country in the year 1961-62. Of these, 25 were in the co-operative sector (Fig. 51).

North India produces about 60 per cent of factory sugar in India. But the sugar-cane being a tropical plant, its yield per acre and its sugar content is higher in the South than in the North. Soil is generally more favourable in the south, but rainfall being inadequate, it has to be supplemented by canal irrigation. As a result, most of the new sugar mills are being set up in the Southern States wherever irrigational facilities are available. Many of these mills are co-operative sugar factories.

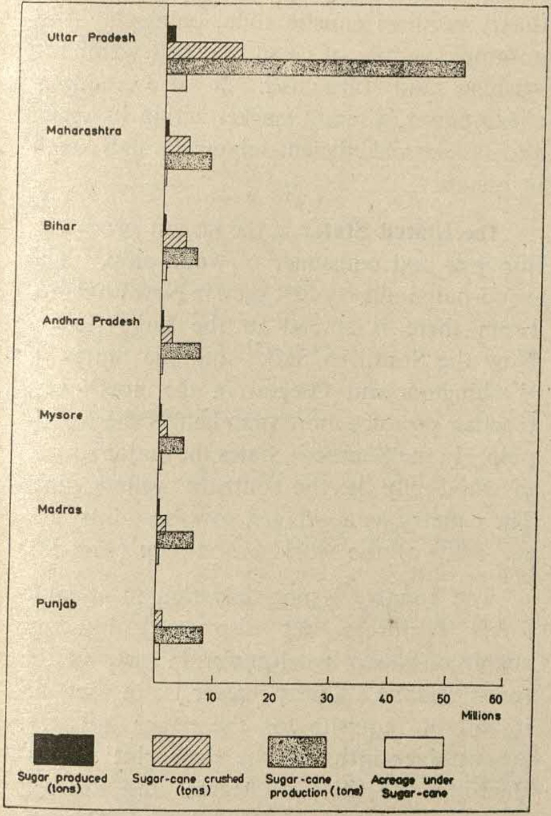

Fig. 51. Sugar Industry in India (1961-62)

Study the diagram carefully and compare the sugar industry in the North with that of the South Do you see any evidence in this diagram which may support the contention that the sugar industry has a tendency to migrate to the South?

In India sugar-cane is produced often by small individual farmers and the crop directly sold by them to the sugar factories. Thus, it is not a plantation industry. The seasonal character of the industry, the low yield and the high price of cane, heavy rents of land, high state taxes, labour problems, great wastage in refining, low sugar content, and meagre production of by-products like rum and alcohol, are some of the problems the sugar industry in India has to face.

Of late, a few associated industries like fruit canning, confectionery, and pharmaceuticals are gradually coming up. There is, however, ample scope to use bagasse, the refuse products in sugar-making, for the manufacture of paper and cardboard, and the pressmud for making shoe-polish and carbon paper. The molasses can be used in the manufacture of plastics, synthetic rubber, chemicals and power alcohol.

Most of the sugar produced in India is consumed locally. Efforts are now being made to export part of the sugar production, to obtain the much needed foreign exchange. As the cost of production is very high, Indian sugar can be sold in the international market only with government subsidy.

France is an important producer of beet-sugar. The raising of the beet crop fits well into the French pattern of diversified and intensive farming. The industry is concentrated mostly in the north-eastern part of the country.

The United States produces both beet-sugar and cane-sugar. The production of sugar-cane and cane-sugar is concentrated in Lousiana in continental United States. The other important State producing cane-sugar is Hawaii. Beet-sugar, however, is more important for the country because of its larger production. The industry is widely distributed in the north-eastern, central and western parts of the country. Yet it has to import refined sugar to meet its home requirements.

The production of beet, and the extraction of sugar from it are highly mechanized operations in the United States requiring very little manual labour.

The other producers of sugar are West Germany, the Philippines, Poland, Mexico, Argentina, China, Czechoslovakia, South Africa, and Puerto Rico.

The international trade in sugar is regulated by the governments of the different sugar-producing countries and by the International Sugar Council of fifty-one countries that have reached an agreement in 1953 about the production and export of sugar.

Paper Industry

Paper is one of the most important items of our present day civilization. It has substantially contributed towards the preservation and spread of human knowledge and culture. The ancient Egyptians made paper from a plant called *papyrus,* from which the word *paper* has been derived.

The technique of paper making was invented by Tsai Lun, a Chinese, in A.D. 105. Rags continued to be the chief paper-making material since the days of Tsai Lun till the middle of the nineteenth century. Good and durable paper for writing and book production is still prepared from linen and cotton rags.

With an enormous increase in the consumption of paper for books, newspapers, and other needs such as wrapping and writing, the bulk of the world's paper is now produced from wood-pulp. Softwood from coniferous trees, especially spruce, is used in marking newsprint. Fibrous plants and grasses, such as esparto, *sabai, bhabar,* and bamboo, are used in paper making where wood-pulp is in short supply. Now-a-days, the waste of cotton, and jute and bagasse, the by-product in the sugar industry, are also used in making certain types of paper, particularly the paperboard.

Besides the basic raw material, the industry requires caustic soda, china-clay and an ample supply of clean and soft water for washing and bleaching. It also requires cheap power, a ready market within its reach and skilled and efficient labour though small in quantity.

The United States is the largest producer, importer and consumer of wood-pulp. The wood-pulp industry first grew in New England. From there it spread to the Lake States. Now the Southern States and the States of Washington and Oregon in the north-west together produce more than half of the wood-pulp. In the Southern States the major source of wood-pulp is the southern yellow pine. The country as a whole now accounts for two-fifths of the world wood-pulp (Fig. 52).

The country is not only rich in suitable forest resources but also has abundant supply of cheap hydel-power in most of the forest regions. Cheap power is, in fact, an important requisite for the paper industry. About three-fifths of the newsprint is produced in the State of Maine, and the rest comes mostly from Washington, Oregon, Texas, and Alabama.

Most of the paper-mills are concentrated in the north-east part of the country which provides a huge market. Paper consumption in the United States is so high that it has to import large quantities of pulp-wood, wood-pulp, and paper, particularly the newsprint, from Canada and a few North European countries. The *per capita* consumption of paper in 1961-62 was 200 kilogrammes as against only one and a quarter in India. In 1953, its total consumption was about two-thirds of the total world production.

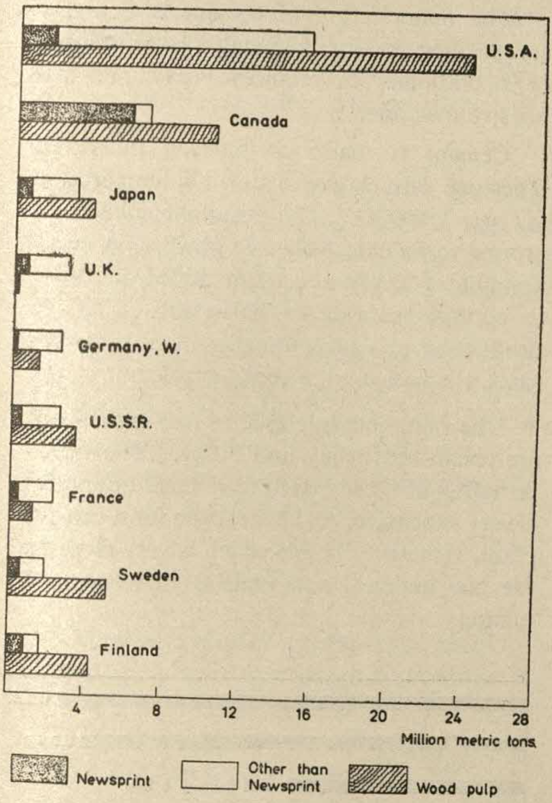

Fig. 52. **Production of Wood-pulp and Paper (1961)**

Most of the world's factories producing wood-pulp and newsprint are situated on the southern edge of the coniferous forests in the Northern Hemisphere. Note the leading producers of wood-pulp. How would you account for the production of paper other than newsprint in the countries like the United States, the United Kingdom, and West Germany?

Canada, the second largest producer of wood-pulp is the leading exporter. It is also the world's largest producer of newsprint, accounting for more than two-fifths of the total world output.

With its large forest resources and the glaciated topography suited to the production of cheap and abundant hydel-power, Canada is favourably placed for the production of newsprint which it can export to other countries.

One-third the total timber cut in its forests is pulp-wood. The provinces of Quebec, Ontario, and British Columbia are the major producers of wood-pulp and paper, particularly newsprint. (*See* picture 59.)

Japan is the third largest producer of wood-pulp and paper. It ranks fourth in the production of newsprint. Japan uses thick tough paper as a substitute for leather and jute textiles, which are in short supply. It also uses hard cardboard for the walls of its traditional houses owing to the frequency of earthquakes.

The raw material of paper comes from paper mulberry, a kind of bush named *udo*, and from seaweed. The country possesses abundant cheap hydel-power for running wood-pulp and paper factories.

In Europe, the **United Kingdom** and **West Germany** are important producers of paper and newsprint. Whereas the United Kingdom depends entirely on imported wood-pulp for its paper-mills, West Germany uses mostly rags and produces fine rag-paper which is exported to other countries.

The Soviet Union comes next in order. Possessing huge forest resources and potential water-power, it holds bright prospects of expanding its existing paper industry. At present its cellulose and paper-mills are located in Europe, the important centres being Leningrad, Kalinin, Smolensk, Karelian Gorky, and Perm in the Urals.

The source of her cellulose and wood-pulp is spruce, fir, and pine from the coniferous forests and aspen and poplar from the deciduous. Most of the cellulose and paper combines are located near the centres of raw materials and on big rivers to ensure water-power and fresh water supplies.

The other producers of wood-pulp and paper in Europe are France, Sweden, Finland, Italy, and Norway. Sweden is the third largest producer of wood-pulp, followed by Finland. The countries of Norway and France also produce some wood-pulp.

India has a relatively small paper industry. The first paper mill was established about a hundred years ago on the Hooghly, near Calcutta. In 1961, there were 28 paper mills, many of them being near the large consumption centres like Calcutta and Bombay. The production of paper in 1961 was 364,000 tons, with another 22,000 tons of newsprint from the government-owned mill at Nepanagar in Madhya Pradesh.

The spruce trees providing softwood occur in the Punjab and Uttar Pradesh, but largely in an inaccessible area. Paper mulberry from Kashmir may prove a useful source of raw material for our growing demand for newsprint. It grows to the required size within 7—10 years as against nearly 60 years required for the second growth of many of the coniferous trees. The bamboo has a still greater advantage over these trees as it takes only four years.

Indian paper mills use *bamboo*, *salai*, *khargol* and *wattle* wood, and *sabai* and *ulla grasses*, bagasse, rags and waste paper in addition to imported wood-pulp. Chemicals and dyes required for the paper industry are also mostly imported. The industry, however, has a bright future in view of the large potential market with the rapid spread of education and literacy.

The Cement Industry

Cement is used now in all kinds of construction works. It saves wood and iron and makes use of relatively cheap material like sand, gravel, and bits of stone in making concrete, an enduring building material. Cement is mixed with sand, gravel, slag, and water and is allowed to harden into an artificial stone known as *concrete*. Concrete can be easily poured into any shape and hence has an advantage over other building materials.

The manufacture of cement is a highly complicated process involving a large number of operations. It requires heavy and expensive machinery.

Cement is made by burning powdered limestone with clay or shale to a temperature of over 1500°C. The resultant clinker is ground to an extremely fine powder. A small amount of gypsum is then added in order to control the rate of hardening. For the production of exceptionally high temperatures, the fuel used is coal, petroleum or gas.

The raw materials used in making cement are cheap but heavy and bulky. The transportation of these materials in large quantities is very expensive. The ideal site for a cement plant, therefore, is one which is very close to the raw material and fuel, as well as to its market.

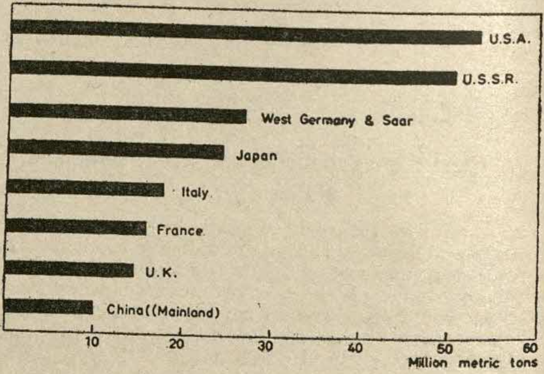

Fig. 53. Production of Cement (1961)

Note that the leading producers of cement are invariably the industrially advanced countries of the world. Work out the *per capita* production of cement in different countries including India.

The leading producer of cement is the **United States** followed by the **Soviet Union**. The other important producers are West Germany, Japan, Italy, France, the United Kingdom and China. The production of cement, like that of iron and steel, is taken as an index of the industrial progress of a country (Fig. 53).

In **India**, limestone and clay of the required quality are available in abundance, generally close to the railway line. The deposits are, however, far-off from the coal reserves.

In 1961, there were 36 cement factories and the production of cement was 8.2 million tons. Estimated production at the end of 1966 is 15 million tons a year. The States of Bihar, Madhya Pradesh, Rajasthan, Gujarat, and Madras produce the bulk of the cement. Although India is now almost self-sufficient in cement, the per capita consumption, which is no more than 20 kilogrammes, is about the lowest in the world. (*See* Appendix VIII.)

The Chemical Industry

Chemical industry covers the establishments producing basic chemicals and factories manufacturing products largely by chemical processes. The industry, therefore, covers a wide range of products, such as dyes, drugs, fertilizers, synthetic rubber and fibers, plastics, explosives and medicines. There are now over 700,000 chemicals listed, of which as many as 200,000 are products of coal-tar.

The primary raw materials of the industry are salts, sulphur, coal, oil, limestone, potash, nitrate, and phosphates. Besides these minerals, the industry now also uses vegetable materials like plants and herbs, wood and cellulose, cotton and jute waste, and bagasse. Furthermore, it largely draws on the cheap and abundant supply of air and water.

The special feature of the industry is that it requires a highly specialized technical staff and large research establishments. It also calls for constant research on economical methods, new products, fresh substitutes and exploration of new fields. Some of the products developed in these industrial laboratories have brought about revolutionary changes in everyday life. Plastics and synthetic fabrics like nylon and terylene are some of the examples. Industrial research entails heavy expenditure. For example, 27 million dollars were spent before bringing out the first pair of nylon stockings!

The chemical industry may be divided into three main branches, namely the heavy chemicals, coal-tar chemicals and derived chemicals.

Heavy chemicals include the production of useful acids like sulphuric acid, hydrochloric acid, and nitric acid; common alkalies like caustic soda, soda ash, bleaching powder; and such chemicals as ammonia and calcium carbide. Common salt is the raw material for alkalies. The raw material used for sulphuric acid is sulphur, or iron pyrites.

Coal-tar chemicals are obtained while making coke or coal-gas from coal. It produces such important materials as ammonia, benzene, naphthalene, aniline dyes, explosives, disinfectants, and scents.

Derived chemicals such as synthetic-rubber, synthetic oil, synthetic fibres, cement, plastics, paper, glass, and chemical fertilizers are products of raw materials that are chemically processed with the help of basic chemicals.

The production and consumption of sulphuric acid, which is the most important of the heavy chemicals, is regarded as a reliable index of the nation's industrial activity. Sulphuric acid is made by roasting pyrites or native sulphur. Countries such as Italy, Japan, Spain, the Soviet Union, the United States, and Norway are rich in raw materials (Fig. 54).

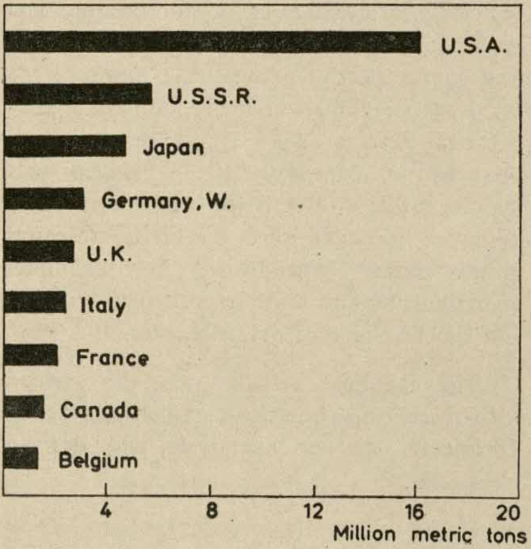

Fig. 54. Production of Sulphuric Acid (1961)

Note the leading position of the United States in the production of this most important manufactured material used by the chemical industry. By using modern methods, the acid is produced at a very low cost—less than a penny per pound. Why is sulphuric acid regarded as an index to the industrial activity of a country?

The United States is the world's largest producer of sulphuric acid; and the *per capita* consumption there was 94 kilogrammes in the year 1962. The industry utilizes large deposits of native sulphur in Louisiana and Texas. Many of the European countries produce sulphuric acid as a by-product of other industrial processes. (*See* Appendix VIII.)

In the United States, the chemical industry is in the north-east sector of the country, with Pennsylvanian coalfields as the chief centre. The region readily offers coal, power, labour, and market.

The Soviet Union has also made considerable progress in the chemical industry and now produces a variety of chemical products. The industry is widely distributed in the Ukraine, European Russia, the Urals, and Central Asia.

Japan possesses large supplies of sulphur. If we go by the total value of its products, its chemical industry ranks third, next to textiles and iron and steel.

West Germany has a very large chemical industry located in the Ruhr Valley, Bavaria, and the Elbe Basin. The industry owes its rapid progress to the presence of salts, coal, and potash and the high standards of education and research in the field of Physics and Chemistry in German Universities.

In **the United Kingdom,** the coal-fields in north-eastern England and South Lancashire offer a base for the heavy chemicals and coal-tar industry. The birth of modern textile industry provided the early impetus to the manufacture of chemicals.

The other producers of chemicals are Italy, France, Canada, and Belgium.

In **India** the chemical industry is yet to assume its rightful role, although the industry has developed at a rapid pace after World War II. The country possesses the required raw materials like salt, limestone, gypsum, kaolin, coal, and oil.

Several heavy chemicals are produced at Bombay, Calcutta, Delhi, Kanpur, Amritsar, Madras, and Bangalore. Coal-tar is manufactured mainly in Bihar and Bengal, near the coal-fields.

There were 45 factories producing sulphuric acid in India, in 1961, with a total production of 422,000 tons. They are mostly around Calcutta and Bombay. Caustic soda factories are working at Rishra (Bengal), Mettur, Delhi, Mithapur (Gujarat), Ahmedabad, and Dehri-on-sone (Bihar). The country is now self-sufficient in caustic soda, soda ash and sulphuric acid.

India is planning to develop its own petro-chemical industry at Bombay and near the new oilfields in Gujarat.

Drugs and pharmaceuticals also are produced in large quantities. Penicillin and streptomycin are manufactured at Pimpri (near Poona), which now produces Haymicine also. Bombay, Baroda, and Calcutta are producing several of the sulpha drugs. Delhi manufactures D.D.T. Spirituous drugs are produced at Kanpur and Lucknow. Several small firms produce indigenous medicines and drugs. At Rishikesh a big pharmaceutical plant is to be set up shortly in the public sector.

Industries depending upon chemicals like the glass and the ceramic industry, the soap industry, and plastics are also making good progress in India.

Chemical Fertilizers

Phosphorus, potassium, and nitrogen are the principal chemical elements in fertilizers

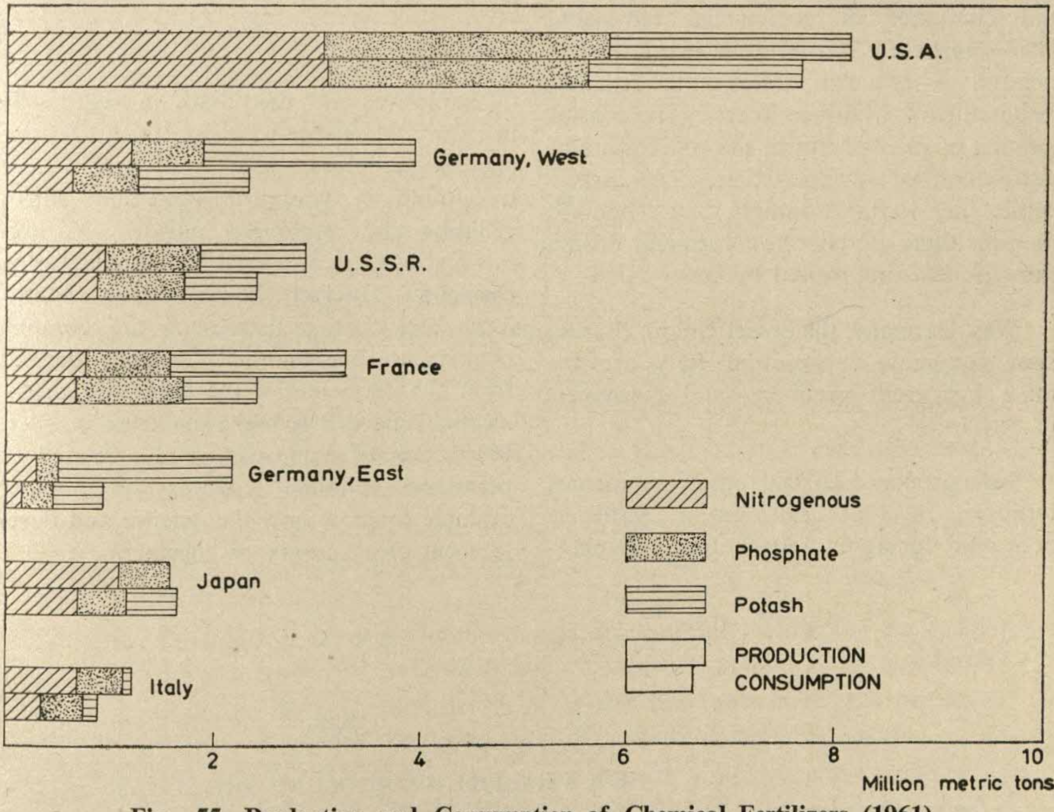

Fig. 55. Production and Consumption of Chemical Fertilizers (1961)

Soil is the most fundamental resource of man. Its fertility depends upon the presence of required quantities of elements like phosphorus, potassium, and nitrogen. Note the leading producers of fertilizers. How far do the progress in this industry and that in agriculture go together?

produced commercially. The industry, therefore, depends for its raw materials on potash, phosphates, and nitrates, and upon the nitrogen obtained from the atmosphere.

Phosphate rocks, which are the fossil remains of animal life, are concentrated in Morocco, Tunisia and Algeria in North Africa, the United States and the Soviet Union. Potash salts are found in East and West Germany and the Soviet Union. Natural sodium nitrate is found in Chile. The bulk of the nitrogen we need for commercial fertilizers is now obtained from the atmosphere (Fig. 55).

The United States is the largest producer and consumer of commercial fertilizers. There are about 700 fertilizer plants in the country. They are all located on the Atlantic seaboard from Maine to Texas. The coastal location of plants helps in the collection and distribution of raw materials. The largest market lies in the Southern States because the soils there are poorer, consequent on the excessive leaching caused by heavy rains.

West Germany, the Soviet Union, France, East Germany, Japan, and Italy are the other important producers and consumers of fertilizers.

India produced 220,000 tons of commercial fertilizers in 1961. Nitrogenous fertilizers accounted for about 150,000 tons and phosphates 70,000. The total consumption within the country, however, was higher—310,000 tons nitrogenous fertilizers, 70,000 tons of phosphate, and 37,000 tons of potash, an aggregate consumption of 418,000 tons. The total demand for fertilizers, however, is even much greater, three to four times more than what we are actually able to produce and import.

The big fertilizer plants of our country are located at Sindri, Nangal, and Trombay. Sindri produces ammonium sulphate; and Nangal and Trombay nitrogenous fertilizers. A chain of fertilizer plants both in the public and private sectors are being set up to meet the growing demand. (*See* picture 60.)

Explosives

Explosives are used both in peace and in war. They are derived from various sources; cellulose made from cotton and wood-pulp is vital for producing nitrocellulose and smokeless powder. Various oils and fats are also used for manufacturing dynamites. In fact, the production of fertilizers and that of explosives are complementary to one another. Acetone derived from the fermentation of corn and grain-alcohol is needed to make smokeless powder. Production of explosives is also related to petroleum refining. This is yet another example to show how the defence and development of a country go together.

EXERCISES

Review Questions

1. Answer the following questions as precisely as you can :

   (*i*) What is industry? How does it differ from occupations such as fishing, hunting, gathering, mining, lumbering, or agriculture?

(*ii*) How did simple tools help man in the past?

(*iii*) What power did he use to run these simple tools or the earliest of the machines?

(*iv*) Name a few tools that represented the beginning of early machines.

(*v*) How did the large-scale use of steam and electric power affect industries?

(*vi*) Why is Watt's steam engine supposed to have initiated the Industrial Revolution?

(*vii*) What machines were responsible for a gradual ousting of the textile establishments from homes to large factories?

(*viii*) What makes the cotton textile industry to migrate from the temperate lands to the warm tropics?

(*ix*) Why is silk called the "fallen queen"?

(*x*) Why is production and use of sulphuric acid regarded as the industrial barometer of a country?

(*xi*) What are the primary raw materials of the chemical industry?

(*xii*) How is the production of fertilizers and explosives complementary to each other?

2. Distinguish between

(*i*) Manures and fertilizers
(*ii*) Staple fibre and continuous fibre
(*iii*) Automation and industrialization
(*iv*) Terylene and nylon
(*v*) Writing paper and newsprint
(*vi*) Chemicals and petro-chemicals

3. What different factors influence the location of industries? Give examples from paper, cotton textile and sugar industries both in India and abroad.

4. How did the Industrial Revolution affect the location of industries and the economic life of the people?

5. Compare the cotton textile industry of the United Kingdom with that of Japan. In what respects does the cotton textile industry of India differ from both of them?

6. Give an account of the jute-textile industry in India. How was the industry affected by the Partition of India? What is its present state of progress?

7. Describe the sugar industry in India and state how it differs from that of Cuba? Compare the world trade of beet-sugar and cane-sugar.

8. Describe the importance and special features of the chemical industry. In what way is this industry related to agriculture?

9. Complete the following sentences by filling the blanks with appropriate words :

(*i*) Rayon fibre is made by chemical process from————.

(*ii*) Nylon is made from——————.

(*iii*) Terylene is made from——————.

(*iv*) Cellulose is obtained from——————and——————.

(*v*) ——————is the principal foreign exchange earner of India.

(*vi*) ——————sugar hardly enters international trade.

(*vii*) The country which is the largest producer, importer and consumer of wood-pulp is——————.

(*viii*) ——————is the most important item in the production cost of cement.

10. Make out correct pairs from the two columns given below :

(*i*) Activities concerned with collecting or making available materials provided by nature.	(*i*) Industry
(*ii*) Systematic production characterized by division of labour and extensive use of machinery	(*ii*) The Industrial Revolution
(*iii*) Change in manufacturing from hand-operated tools to power-driven machinery.	(*iii*) Primary industry
(*iv*) Machines doing the work of hundreds of workers automatically.	(*iv*) Automation
(*v*) Activities undertaken to transform raw materials into commodities that are directly useful to man.	(*v*) Automachines
(*vi*) The current and more sophisticated phase of industrial Revolution with far greater emphasis on labour-saving devices.	(*vi*) Secondary industry

11. Complete the following statement by choosing the correct ending :

(*A*) The production of handloom fabrics in India is mainly encouraged because

(*i*) they are invariably more durable and cheaper than the mill-woven fabrics.

(*ii*) they earn considerable amount of foreign exchange.

(*iii*) they provide full or part-time employment to a large number of people in rural areas.

(*iv*) they occupied a place of pride in our struggle for national freedom.

12. Read the following statements carefully and indicate which are true and which are false :

(*i*) Machines are to be blamed for many of our economic and social ills, viz., unemployment, congestion in cities and various labour problems.

(*ii*) Availability of cheap and ample labour invariably leads to low cost of production.

(iii) Highly populous lands are lucky in that they never face any kind of shortage of labour.

(*iv*) Higher wages of labour, particularly in countries with a high standard of living, may at times prove more economic than the low wages of labour in many of the developing countries.

(*v*) Wars being very destructive have always affected industries adversely.

(*vi*) In spite of very good irrigational facilities and fertility of soil in North India, the Indian sugar industry has a tendency to migrate towards the South.

(*vii*) Bamboo is a poor and uneconomic substitute for softwood of the temperate lands as a raw material for paper.

(*viii*) Today there are as many as 200,000 products of coal-tar alone, which speak very highly of the research investment and experimentation involved in chemical industry.

(*ix*) Silk and synthetic textile industry in the United States is known as "parasitic industry" as it thrives at the expense of cotton textiles and other industries.

Re-write the wrong statements correctly, giving argument in support of your contention.

Finding Out

(*i*) Visit an industrial establishment in your neighbourhood and find out the various locational factors that are favourable and others that may not be so favourable. You may perhaps be required to do some map-reading.

(*ii*) Survey your neighbourhood and prepare a brief report answering the following question: Are there any problems created in your neighbourhood owing to the transition from a peaceful and leisurely rural life to a hectic, and complicated urban life?

(*iii*) Find out all that you can about the chemical fertilizer industry in India and the efforts being made to expand it. How far would these efforts go, in your opinion, to solve our food problem?

Cartographic Work

(*i*) Show graphically the progress being made by the following industries in India :

(*i*) Paper; (*ii*) Cement; (*iii*) Chemical fertilizers; and (*iv*) the production of sulphuric acid.

(*ii*) Draw maps of India showing the distribution of cotton textiles and sugar industry in India preferably by the dot method.

Picture Reading

A large number of pictures in the book relate to the production of raw-materials of textile industry and the phases involved in the production of various fabrics. Arrange these pictures in a proper sequence and write a story of clothing, from beginning to end, with the help of these pictures.

Films Available

i. Fibres to Fabrics. No. 677.2; 10 mins; Hindi; D.A.V.E.
ii. Making Cotton Clothing. No. 677.2; 11 mins; English; D.A.V.E.
iii. Warm and Fleecy. No. 677.3; 11 mins; Hindi; D.A.V.E.
iv. Weave Me a Rainbow. No. 2336; 25 mins; English; B.I.S.
v. From Silkworms to Parachute. No. 677.41; 10 mins; Hindi/English; D.A.V.E.
vi. Synthetic Fibres——Nylon & Rayon. No. 677.4; 15 mins; English; D.A.V.E.
vii. Textiles Unlimited. 28 mins; English; U.S.I.S.
viii. Pulp and Paper from Canada. 22. mins; English; C.H.C.
ix. Story of Paper Making. No. 676.2; 17 mins; English; D.A.V.E.
x. Story of Sindri. No. 631.8; 10 mins; Hindi; D.A.V.E.
xi. Wealth from Waste. No. 697; 11 mins; Hindi; D.A.V.E.
xii. This is Automation. 30 mins; English; U.S.I.S.
xiii. Double Bond. No. 2306; 28 mins; English; B.I.S.
xiv. Trombay. No. 665.53; 22 mins; Hindi; D.A.V.E.

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CHAPTER 8

Heavy Industries

THE location of industries is largely determined by the heavy and bulky character of the raw materials needed for them, as well as by the finished products turned out by them. Obviously, these industries are much concerned with transport costs as they have to handle large quantities of materials, both heavy and bulky.

The industry, in addition, consumes enormous amount of power which requires huge investments. But the number of people employed in them is relatively small. Owing to the peculiar and specialized nature of the work required in them, in some cases demanding enormous physical effort, the number of women employed is even smaller. These industries are known as *heavy industries.* The iron and steel industry provides the best example of a heavy industry.

THE IRON AND STEEL INDUSTRY

The iron and steel industry constitutes the backbone of modern industrial economy. Thousands of products made of iron and steel influence our daily life. Iron and steel are used in making machines, tools, and a variety of durable goods. It is basic for the construction of railway lines, large bridges, and various means of transport and communication. It would be impossible to harness the great power of coal, petroleum and water without iron and steel.

No wonder then, the manufacture and consumption of iron and steel is taken to be the index of a nation's business activity, the standard of living of its people, and its defence potential.

Manufacture of Iron and Steel

Modern steel-making involves three major steps—reduction, purification, and shaping. First, the iron-ore is reduced to pig-iron in a blast furnace. Second, pig-iron is converted into steel by removing impurities from it. Finally, the metal is shaped by different processes such as rolling, pressing, casting, or forging.

Iron-ore contains oxygen and other impurities. They are removed by smelting the ore in a blast furnace in which coke is used as the fuel. A mixture of iron-ore, coke and limestone in the approximate proportion of 4:2:1 is subjected to great heat by forcing a blast of very hot air into the mixture in the furnace. (*See* picture 62.) The coke burns, and the oxygen and other impurities in the ore combine with the carbon (coke) and limestone to form slag. Because of its higher density, molten iron collects at the bottom with the slag floating on it. This liquid iron can be taken out through pipes at the bottom of the furnace and run off into moulds for cooling into any required shape. As these moulds are called *pigs* (because of their resemblance to a herd of pigs), the solidified iron thus obtained is known as *pig-iron.*

Pig-iron contains carbon and very often sulphur or phosphorus as impurities. Moreover, it is brittle. By removing its impurities and tempering it by sudden cooling, it is converted into steel. Steel is soft or hard according to its carbon centent. Alloy steels with specific properties are obtained by adding small but required quantities of certain metals like manganese, nickel, chromium, and tungsten.

Location of the Industry

Iron-ore, coal, and limestone are the raw materials of the iron and steel industry. The amount of coal required for smelting a ton of iron-ore is generally one and a half to twice the quantity of iron-ore by weight. Furthermore, the ore being less bulky than coal, the hauling of iron-ore to the coal-field is, therefore, more economic. As a result, the iron and steel industry has a tendency to gravitate towards coal-fields. Moreover, coal-tar and other by-products of coal can be used more profitably at the coal-field to set up a number of other industries.

Modern steel plants are very big and usually have different sections producing pig-iron, coke, steel, rails, and sheets, all at one location. This brings down fuel and transport costs. Large-scale operations further help in reducing unit-costs still further.

As may be expected, great iron and steel plants are developed in most of the leading countries, either near coal-fields or near ports where ample facilities exist for the assembling of raw materials and the distribution of finished products. In some cases, if the iron-mines and coal-fields are far apart, the plants are located in both the areas. This provides return cargo for the wagons or ships and helps to reduce transport costs.

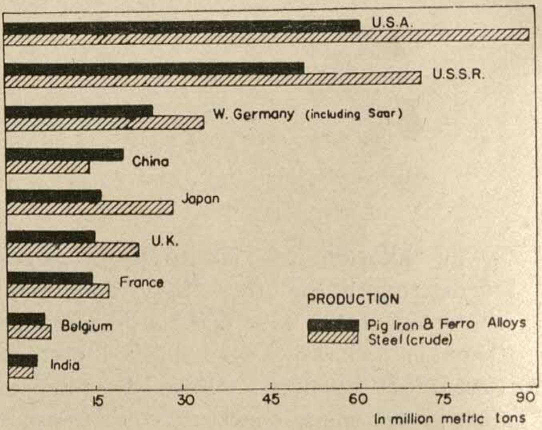


Fig. 56. Production of Iron and Steel (1961)

The development of a sizeable iron and steel industry is an index not only of the industrial progress and great wealth but also of the political and military power of a nation. Steel is often described as the greatest of the sinews of war. Why is it so?

Principal Iron and Steel Manufacturing Regions

The United States is the largest producer of iron and steel accounting for nearly a fourth of the total world production. The important centres of production are: Middle-Atlantic seaboard, Pittsburgh-Youngstown District, Lake Erie region, Chicago-Gary, and Birmingham-Alabama area (Figs. 56 and 57).

Middle Atlantic seaboard manufacturing region was the first centre of the industry with its important plants in Maryland and Pennsylvania States. Bethlehem and Sparrows Point are two of the largest plants in this region. This manufacturing region is becoming more important because of the

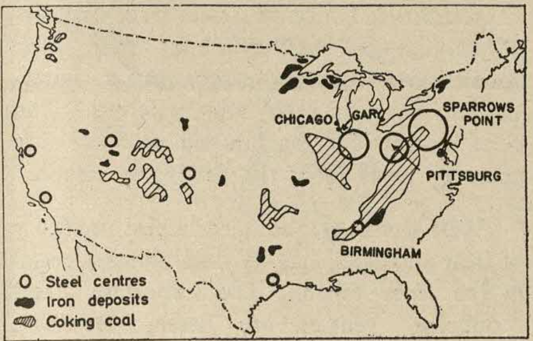


Fig. 57. Iron and Steel Centres of the United States (Adapted from E.V. Cleef and J.C. Finney)

Note that the north-eastern manufacturing region of the United States also leads in iron and steel production. What factors are responsible for the concentration and growth of the industry in this part of the United States?

growing imports of iron-ores from Labrador, Venezuela, Brazil, Chile, and Spain and subsequent exports of finished goods to overseas markets.

Pittsburgh-Youngstown District is the leading centre of the United States iron and steel industry. It is located on the North-Appalachian coal-fields. Its rapid growth is ascribed to the availability of coking coal locally and easy accessibility to iron-ore in the Lake Districts. The Great Lakes provide an easy and cheap inland water transport. A cluster of iron and steel towns have sprung up around Pittsburg which together account for over a third of the country's production.

Lake Erie region is another steel-producing area with plants at Buffalo, Erie, Cleveland, Lorain, and Detroit. Railway trains carry iron-ore from these Lake ports to the Appalachian centres and return with coal.

Chicago-Gary region on the southern tip of Lake Michigan is another important manufacturing area, where iron-ore from Lake Superior region meets coal from the southern Illinois and Appalachian fields. The largest

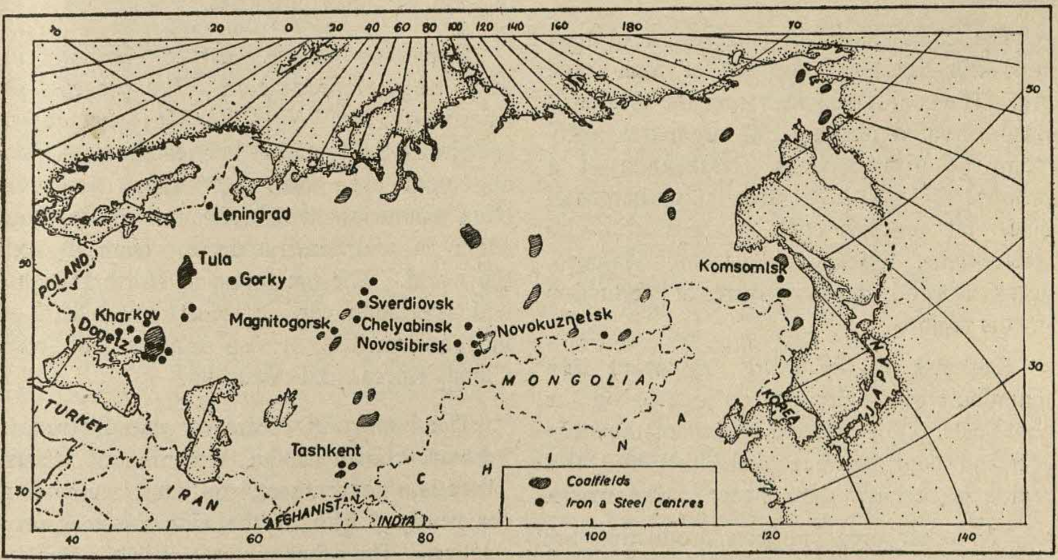


Fig. 58. Coal-fields and Iron and Steel Centres of the Soviet Union

Note the location of the iron and steel industry in relation to coal-fields. How does the distributional pattern differ from that of the United States?

plants of this region today rival with those of the Pittsburgh region.

Birmingham-Alabama industrial area is situated in the South Appalachian coal-fields. Coal, iron-ore, and limestone are available in the vicinity. The ore is, however, of low quality and the region is away from the main markets. Yet the industry has steadily grown with iron imported from Venezuela in South America.

The Soviet Union is the second largest producer of iron and steel accounting for a fifth of the total world output. Its important iron and steel production centres are: southern Ukraine, the Urals, and Kuznetsk (Fig. 58).

The leading iron and steel manufacturing region is southern Ukraine near the Black Sea and the Sea of Azov. The industry draws on the coal of the Denetz Basin and the rich ores of Krivoi Rog. Manganese deposits are also not far. The smelting plants are located both near iron mines and coal-fields.

The Urals manufacturing region of iron and steel has large deposits of high-grade ore. The coal is supplied from the Kuznetsk Basin situated about 2,250 kilometres away from the iron deposits. Karaganda at a distance of 1,000 kilometres is another coal-field that supplies coal to these iron and steel plants. Nizhyny Tagil and Magnitogorsk are two important centres of production in this region.

Kuznetsk is the third important iron manufacturing region and is located on the coal-fields. The haulage by rail of the iron-ore and coal between the Urals and this region is perhaps the longest in the world.

The other areas of iron production are around Cherepovets near Leningrad, Rustavi in Trans-Caucasia, Tashkent in Central Asia, Irkutsk near Lake Baikal, in the Amur Valley, and at Vladivostok.

The Soviet Union possesses large deposits of iron and coal but they are far apart. The country also lacks favourable inland waterways to haul the bulky raw materials. The chief markets for the finished products are generally away from the producing region.

West Germany, the third largest producer of iron and steel, has its steel plants located in the Ruhr Basin. The important steel-producing centres are Essen, Bochum, Gelsenkirchen, and Solingen (Fig. 59).

The small area of 80 kilometres on either side of the Ruhr has the highest density of iron and steel plants in the world. It has the largest and the best coal deposits in Western Europe. The local iron-ore comes from Siegerland, Salzgitter and Bavaria. But the main supply comes from the Lorraine and Luxembourg fields. Ore is also imported from Spain and Sweden. Coal is sent to Lorraine, Luxembourg, Spain and Sweden as return cargo, cutting down thereby transport costs and encouraging steel production in those countries.

Japan now stands next to Germany in iron and steel production. The progress of its industry since World War II is spectacular, in spite of the fact that her resources of iron and coal are poor. It imports iron-ore from countries like India, the Philippines, Malaysia, and Brazil and scrap from all over the world. The ore found in North Honshu and Hokkaido cannot meet even a fifth of its requirements. It also imports coal from China, Korea, and Australia.

The important centre of manufacture is Yawata, known as the Pittsburgh of Japan. There is a government iron plant accounting for nearly a fifth of the nation's steel production. The other centres are in the Osaka-Kobe and Tokyo-Yokohama conurbations.

The United Kingdom has large deposits of high-grade coal. But its iron-ore is of a

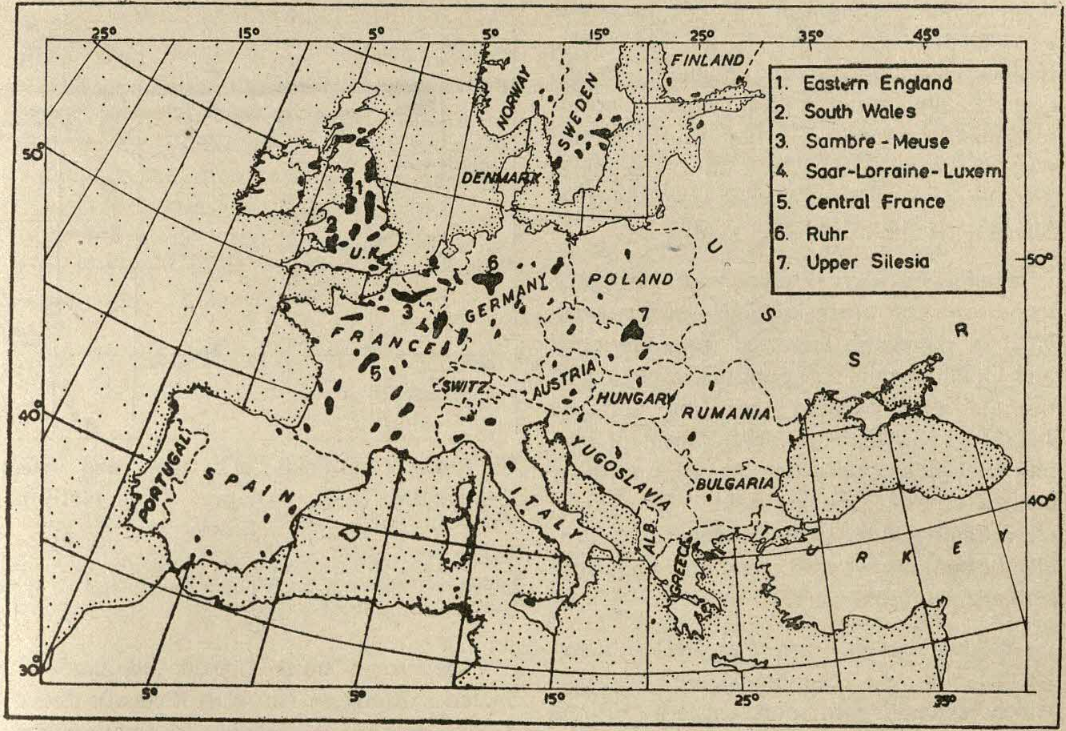


Fig. 59. Iron and Steel Centres of Europe

West Germany is the leading producer of iron and steel in Western Europe. What factors are responsible for the growth of this industry in this country? How far does the location of the United Kingdom help it to sustain its industry?

low quality, much of which has now been exhausted. Hence, iron-ore is imported from other countries like Sweden and Spain and also from North Africa.

In 1850, it produced half of the world's iron and 70 per cent of the steel. In 1961, its share fell to just 6 per cent of the world output because the industrial revolution which first took place in Britain has now reached many countries of the world that are more favourably placed in terms of natural resources.

Its nearness to the sea and well-developed transport system have helped the iron and steel industry to grow here and face competition successfully from several countries.

The chief areas of production are the steel centres of Eastern England which account for half the country's production. Middlesbrough is the leading centre followed by centres such as Newcastle, Leeds, and Sheffield, all of which utilise the coal-fields of Yorkshire and Durham-Northumberland.

Another area that rivals Middlesbrough is South Wales, the important centres being Ebbw Vale, Swansea, Cardiff, and Port Talbot; the last one has the reputation of being the largest steel plant in Europe. Other important centres are those of Glasgow, Barrow, and Liverpool.

China stands next in order and has made rapid progress. Its steel production is less than that of its pig-iron. It now possesses a modern steel industry in Manchuria originally developed by the Japanese. Anshan is the leading iron and steel centre. Paotow in Inner Mongolia, Taiyuan to the south-west of Peking, and Wuhan on the Yangtze are the new centres of the iron industry. Shanghai is the other older centre.

France has large reserves of low-grade iron-ore in the north but lacks quality coal. Coal is, therefore, imported from Germany and Great Britain. The mutual exchange of ore and coal between the Ruhr and the Lorraine has led to the development of iron and steel industry at Metz, Nancy, and other centres on the Lorraine fields. In France, electric furnaces based on a number of hydro-electric stations are also commonly employed in the smelting industry.

Belgium has its iron and steel industry located on the Sambre-Meuse coal-field which extends into north-eastern France. The iron plants are located on the navigable waterways as iron-ore is imported from abroad.

The other producers are Italy, Czechoslovakia, Poland, and Canada, all of whom produce more than ten million tons of pig-iron and crude steel. In 1961, the production of each one of them was higher than that of India.

India, in the year 1961, produced 5.1 million tons of pig-iron and 4.07 million tons of crude steel. The Third and the Fourth Five-Year Plans envisage big expansion of the iron and steel industry in India (Fig. 60).

We possess abundant resources of iron-ore, and limestone and reasonably good wealth in coal. They are all found very close to each other, giving a distinct advantage of location. The only anxiety is the possible exhaustion of the high-grade coal reserves in the near future, unless they are utilized very judiciously.

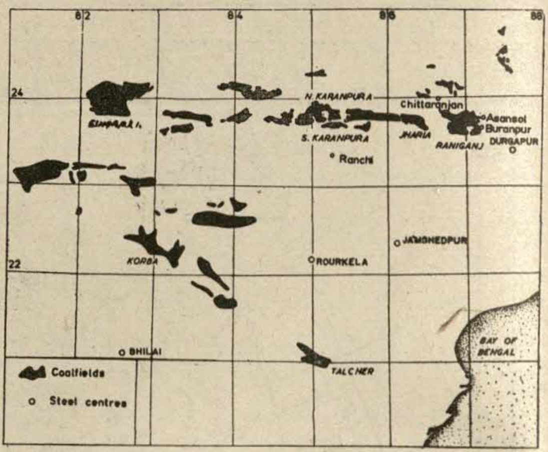


Fig. 60. Coal-fields and Iron and Steel Centres in India (Adapted from National Atlas of India)

Note that the concentration of the iron and steel industry is mostly in the Chhota Nagpur region. Why is it called the Ruhr of India?

The great horse-shoe-shaped coal belt includes Raniganj (in West Bengal), Jharia, Girdih, Bokaro, Karanpura (in South Bihar), Tatapani, Singrauli, and Korba in Madhya Pradesh, and Talcher in Orissa. One of the largest deposits of rich iron-ore lies within this horse-shoe belt and it includes Mayur-

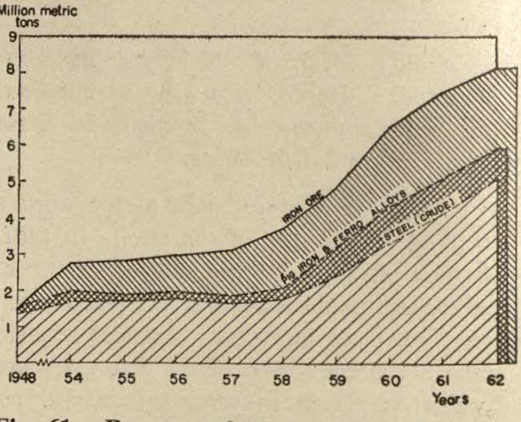


Fig. 61. Progress of Iron and Steel Industry in India (1948-1962)

Note the steady growth in the production of iron-ore, pig-iron and steel since Independence. Work out the *per capita* production of the three in the years 1948 and 1962. How does it compare with that of the United States and Japan ?

bhanj, Keonjhar, Bonai (in Orissa), and Singhbhum (in Bihar). Limestone, dolomite, manganese, and other alloy metals are also available in, or near this area. The rich iron ores of Durg in Madhya Pradesh and Chanda in Maharashtra are not far away. Naturally, the iron and steel plants of Asansol, Durgapur, Jamshedpur, Bhilai, and Rourkela and the proposed plant at Bokaro are all located in this area (Fig. 61).

Jamshedpur is located at the confluence of the Subarnarekha and the Khorkai at a distance of about 250 kilometres from Calcutta. It uses iron-ore from Mayurbhanj and Bonai Districts of Orissa and the Singhbhum District of Bihar, limestone from Gangapur, and manganese from Orissa and Madhya Pradesh. Coal comes from the Jharia fields. (*See* picture 63.)

Durgapur is in the Damodar Valley. It is within 200 kilometres from the port of Calcutta. It uses iron-ore from Singhbhum, and limestone and manganese from Orissa and Madhya Pradesh. Coal comes from the nearby Jharia-Raniganj fields.

Bhilai is in Madhya Pradesh. It uses ore from Durg, limestone from Raipur and Bilaspur, manganese from Balaghat and coal from Jharia. (*See* Picture 61.)

Rourkela, near the Brahmani, is in Orissa. It uses iron-ore from Bonai, coal from Jharia and Raniganj and local limestone. Ore and limestone from here are sent by rail to the Damodar Valley and the wagons return with coal from there.

Of these four big iron and steel plants in India, only that of Jamshedpur is privately owned. The other three are State concerns, sponsored and managed by the Government of India. These plants have been developed in collaboration with the Soviet Union (Bhilai), West German firms (Rourkela), and British concerns (Durgapur).

In the South, the only big plant is at Bhadravati in the forest belt of Mysore. It gets its ore from the nearby Bababudan fields, limestone from Bhandigudda (20 kilometres east), and manganese from Shimoga and Chitaldrug (within 50 kilometres). It once used to depend entirely on charcoal but now it uses hydel-power from the Jog Falls and Sharavati for the electric furnaces.

There are a number of smaller centres particularly in the Damodar Valley. The notable ones amongst them are located near Asansol, at Burnpur, Kulti, and Haripur.

AUTOMOBILE INDUSTRY

Automobile manufacturing is a heavy industry based on quality iron and steel. Assembly business is a characteristic feature of this industry, as a large number of parts made of a variety of raw materials are to be fitted into every car or vehicle that is produced. (*See* picture 65.)

Automobiles were first manufactured in Western Europe in the latter half of the last

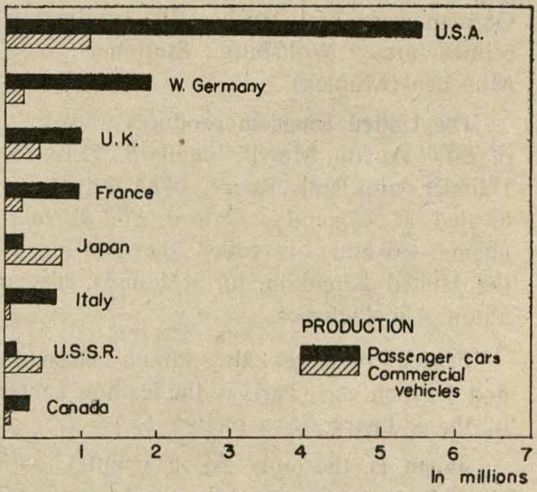


Fig. 62. Production of Motor Vehicles (1961)

Note the dominating position of the United States, Germany being a poor second. What factors are responsible for the phenomenal growth of this industry in the United States?

century. It would be wrong to ascribe the invention of the automobile to any single inventor or even to any single country.

The industry, as such, has grown tremendously since the beginning of this century in Europe and the United States, particularly in the latter, which alone accounts for nearly half the total world production (Fig. 62).

The United States produces well-known cars such as Ford, Chevrolet, Pontiac, Cadillac, Chrysler and Plymouth. The three giant concerns dominating the market are General Motors, Ford and Chrysler. These concerns produce almost everything that they need including paint and glass. The industry is mostly located around the Great Lakes, Detroit alone accounting for 25 per cent of the nation's production. The other important centres are Chicago, Buffalo, and Indianapolis.

West Germany is the second largest producer; but her production is only about one-third that of the United States. Volkswagen and Mercedes are famous among German cars and trucks. Its production centres are Wolfsburg, Stuttguart, and Munchen (Munich).

The United Kingdom produces a variety of cars—Austin, Morris, Standard, Hillman, Daimler, and Rolls Royce. The industry is located at Coventry, Oxford, and Birmingham. Coventry is called the Detroit of the United Kingdom, for it houses eleven automobile factories.

France produces the famous Renault and Citroen cars. Paris is the leading centre of the industry. (*See* picture 65.)

Japan is the only Asian country with significant production. It produces commercial vehicles and small, light and low-priced cars. The industry has been organized on modern lines and is making rapid progress.

Iatly produces the well-known Fiat cars at Turin.

The important production centre of the industry in the Soviet Union is Gorky.

The automobile industry in **India** is in its infancy. There are three centres, one each in Bombay, Calcutta and Madras. The cars produced at these centres are Fiat, Ambassador and Standard respectively. Trucks are produced at Jamshedpur and Madras. They are Tata-Mercedes and Ashok-Leyland. In 1961, the country produced 28,700 passenger cars and 25,600 commercial vehicles. The industry has a bright future in view of the large potential market, and the government is also encouraging the industry through restriction on imports.

MANUFACTURE OF RAILWAY ENGINES AND WAGONS

From the first railway engine, *the Iron Horse*, in England before which a courier rode on horseback with a red flag to warn traffic on the way, to the modern diesel engine, is a thrilling story of progress.

Rails and wheels of rolling stock are generally prepared in, or near steel plants. They are entirely made of steel. So are wagons for carrying goods. The passenger coaches have several parts that can be manufactured in other factories. Plate glass, upholstery, electric fans, lamps and other equipment, window shutters, water tanks, looking glasses, are some of these.

Nowadays, the whole body of a railway coach is made of steel, as we now see in the new coaches of the Indian Railways. This is the integral coach. These need not necessarily be made at a steel centre. Sheets and other forms of steel prepared at a steel plant may be used elsewhere as in the Integral Coach Factory at Perambur near Madras. (*See* picture 67.)

Railway locomotives, however, are manufactured in special factories. A great amount of steel has to be used. The sheet iron has to be tested in several ways before use. Steam, diesel, and electric locomotives have different requirements of manufacture in respect of design, technical details, and quality of performance.

The main centres of railway-engine manufacture are Chicago, Philadelphia, Schenectady, and La Grange in the United States; Birmingham, Crewe and Derby in the United Kingdom, the birthplace of locomotives; Le Creusot and St. Etienne in France, Essen and Dusseldorf in West Germany; and Gorky, Kharkov and Voroshilovgrad in the Soviet Union.

India has three factories producing locomotives, one each at Chittaranjan, Jamshedpur (Tatas), and Varanasi. Chittaranjan Locomotive Factory, which is a State concern produces broad-guage railway engines, while TELCO (Tatas) produces metre-guage engines. Chittaranjan factory now produces electrical engines as well. (*See* picture 66.) Diesel locomotives are manufactured at Varanasi.

Every railway undertaking has to maintain efficient workshops at different places. Though their chief job is to repair locomotives, coaches, wagons, and several other equipment, they often produce coaches and wagons.

SHIPBUILDING INDUSTRY

Shipbuilding is a very old industry. Before the days of iron and steel, ships were built of timber. The old Mediterranean powers like Rome and Greece and the later sea-faring countries like Spain, Portugal, Great Britain and Norway were leaders in shipbuilding. In the days of the East India Company, India built sailing ships at Surat and Broach.

With the coming of iron and steel, however, the picture changed considerably. The building of a large ocean-liner is now perhaps a more complex process than producing a railway-engine or a motor car. Materials of a varied nature have to be used in shipbuilding. The basic material, however, is iron and steel. Yet, a ship is not built by the mass production method on an assembly line as is the case with the automobile industry. Elaborate plans, and highly skilled labour, are called for, owing to the increase in size and improvements in engineering and equipment. Modern shipbuilding is carried on in deep, spacious estuaries, adjacent or accessible to large steel-producing centres.

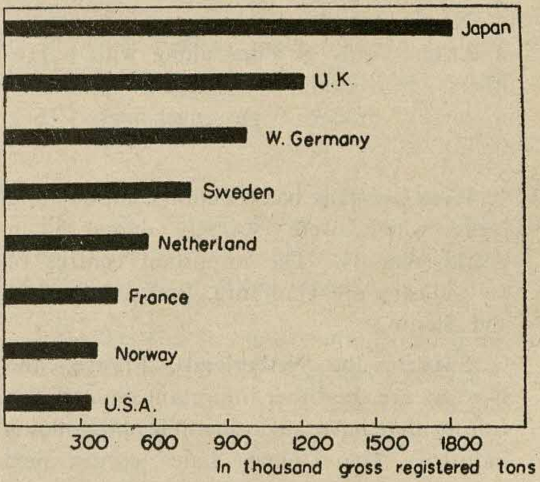


Fig. 63. Shipbuilding Industry (1961)

The diagram represents the tonnage of the merchant vessels launched by some countries in the year 1961. (The data for the Soviet Union is not available.) Note that Japan has superseded the United Kingdom which led the world in shipbuilding till 1955. What factors have favoured the rapid expansion of the industry in Japan?

Japan today ranks first in shipbuilding, having overtaken the United Kingdom, the, former "mistress of the seas". It also leads in export of ships. Its capacity to build huge ships is now unsurpassed. The Korean War gave an impetus to expand its shipbuilding industry. It was then the only country in a position to accept large orders at comparatively low costs with an assurance of quick delivery. This it could do because of of the complete modernization of its industry (Fig. 63).

The industry is located in the three districts of Tokyo—Yokohama, Kobe-Osaka, and Maji-Shimonoseki. These areas have iron and steel industry and an ample supply of skilled labour.

The United Kingdom now stands second to Japan in shipbuilding. Its chief centres of shipbuilding are on the mouths of Tyne, Wear and Tees in North-East England, the Clyde estuary in Scotland and Belfast in North Ireland. Each centre specializes in certain kinds of ships along with a few others. For example, Glasgow specializes in large modern passenger-liners. (*See* picture 68.)

West Germany has rebuilt its shipbuilding yards which were severely damaged in World War II. The important centres of the industry are Hamburg, Bremen, Emden, and Stettin.

Sweden, the Netherlands, France, and Norway are the other important countries in Europe that have a considerable shipbuilding industry. The United States comes next in order. Its important shipbuilding centres are around the spacious harbour of New York, and on the bays of Delaware and Chesapeake. The Soviet Union has shipyards at Nikolayev, Sevastopol, Leningrad, Murmansk, Archangel, and Vladivostok.

India is developing its shipbuilding industry at Vishakhapatnam and Cochin. The shipbuilding yard at Vishakhapatnam has already constructed a few ocean going vessels. (*See* picture 69.) The Indian Navy has a plan to construct naval ships at Mazgaon Docks near Bombay. The present rate of development of this industry is not sufficient for India to depend on ships built in its own yards.

THE AIRCRAFT-MANUFACTURING INDUSTRY

Orville Wright made his first successful flight in 1903 in North Carolina. World War I gave a fillip to the production of aeroplanes and during the War, the United States and Europe produced nearly 16,000 planes each. After the War, the industry declined.

By about 1925, commercial airlines were started in the United States and Europe; military planes were also produced in great numbers. Japan and the Soviet Union also joined in the production of military planes. The trans-Atlantic and trans-Pacific flights by Lindburg and Byrd roused public interest. By 1940 commercial networks of airways had been set up in Europe and the United States connecting distant places in the world.

World War II saw a great rise in the aircraft industry of Germany, Italy, the Soviet Union, the United Kingdom, the United States, and Japan. Great advance was made in the technical knowledge of aircraft construction. The industry requires a huge capital outlay and an extremely skilled labour. Hence this industry is developed mainly in industrially advanced countries.

In the **United States,** the states of New York, Michigan, Connecticut, Ohio, and New Jersey have most of the plants for aircraft production. Other centres lie in Kansas and in Texas at Fort Worth and Dallas, and on the Pacific coast at Los Angeles and Seattle.

The Soviet Union has aircraft production centres in the Volga valley, the Moscow area, and Western and Eastern Siberia.

Most of the aircraft manufacturing centres of the **United Kingdom** are in the lowlands of South-Eastern England because of the best local weather conditions.

German plants were bombed and smashed out in World War II. Italy had centres in Turin, Milan, and Naples. Most of these German and Italian plants were destroyed in the War, but they have now been mostly reconstructed.

Before World War II, **Japan** had centres in Japan itself and in Manchuria and Korea. Now the centres are in the industrial area Tokyo-Yokohama-Kanagawa; Kobe- Osaka-Kyoto, and the Nagoya areas.

In **France,** Paris is the centre of aircraft production. Several other countries too have their production centres.

India also has two aircraft production centres, one each at Bangalore and Kanpur. The Defence Ministry has plans for two plants, for construction of frames and engines of aeroplanes in Maharashtra and Orissa respectively.

THE TEXTILE-MACHINE INDUSTRY

The textile industry has always been in need of elaborate machinery. Highly skilled labour, technical knowledge, a laboratory for testing and improving machines, and a nearby market are the requirements of the textile-machine industry. Different establishments specialize in the production of different types of machines. For example, Worcester in the United States produces only looms of different types suitable for weaving all types of fabrics.

Lancashire in the **United Kingdom** specializes in cotton-textile machinery. Yorkshire specializes in machinery for woollens. Nottingham and Leicester produce hosiery machinery. Nottingham also specializes in lace making machinery, Macelesfield in silk machinery, Dundee in jute and hemp machinery and Belfast in linen machinery. Though these factories produce primarily for the local markets, much of the machinery produced enters international trade as well.

East Germany has textile machinery factories in Chemnitz and Zwickau. France has such establishments at Lille and Valenciennes. In Asia, Japan makes textile-machinery in its cotton and silk-textile manufacturing area of Kobe-Osaka.

India has still to import various kinds of looms used in its mills. Shuttles and a few other small things are, however, being made now at Coimbatore, Bombay, and Ahmedabad.

EXERCISES

Review Questions

1. Answer the following questions very briefly:
   (*i*) What are the characteristic features of a heavy industry?
   (*ii*) Why is the iron and steel industry believed to be the backbone of the modern industrial economy?
   (*iii*) What makes the manufacture of iron and steel an index of the defence potential of a country?

(*iv*) State the three major steps involved in modern steel making.

(*v*) In what way do the steel and steel alloys differ from iron?

(*vi*) How did pig-iron achieve its present name?

(*vii*) Why is iron and steel industry generally located on a coal-field?

(*viii*) Point out the most characteristic feature of the automobile industry.

(*ix*) What is meant by an integral coach?

(*x*) How does the shipbuilding industry differ from the automobile industry?

(*xi*) Why is aircraft manufacturing industry confined only to highly industrialized countries?

2. Give a brief account of how steel is made from iron-ore step by step. Name the important basic raw materials used in the preparation of steel and steel alloys.

3. Compare the iron and steel industry of the United States and the Soviet Union, bringing out the difference in their locational factors.

4. Review the progress being made by the iron and steel industry in India. Would you justify the high concentration of the industry only in the eastern part of the country?

5. What are the basic requirements of an efficient shipbuilding industry? Compare the industry as it stands now in the United Kingdom and in Japan.

6. Make out correct pairs from the two columns:

i) Secondary industries in which even female labour can be employed profitably.	*i*) Parasitic industries
ii) Industries which are fundamental to other industries.	*ii*) Heavy industries
iii) Industries much concerned with the transportation cost of their raw materials and finished products	*iii*) Light industries *iv*) Cottage industries
iv) Industries located near other industries to be able to employ female labour on economic terms.	*v*) Basic industries *vi*) Subsidiary industries

7. Complete the following statements with the correct ending:

A) The iron and steel industry is generally located on or near the coal-fields because :

i) they provide steam and electric power.
ii) they provide the necessary raw materials—coal and limestone.
iii) smelting of iron requires more of coke than iron-ore.
iv) the amount of coal required for smelting a ton of iron-ore is generally one and a half to twice the quantity of iron-ore.

B) The iron and steel industry in the Urals is located on the iron-field because.

i) coal is brought as a return cargo from the far-off coal-fields.

ii) smelting requires less of coke than iron-ore.
iii) coal and limestone are not far from the site.
iv) it is easier to haul coal from coal-fields than to carry iron-ore.

8. Make out the correct pairs from the two columns given below:

	Significant Locational Factors	*Industry*
i)	Quick access to raw material which happens to be relatively heavy and perishable.	Paper
ii)	Proximity to raw materials which are bulky and heavy, in addition to a ready market.	Iron and steel
iii)	Warm tropical, sudan or monsoon type of lands where local raw material, cheap labour and potential market are within easy reach.	Sugar
iv)	A plentiful supply of clean and soft water and local or imported raw material, preferably of different varieties is available in addition to skilled labour and a wide market.	Cotton textile
v)	An ample supply of clean and soft water together with small but efficient labour and a ready market.	Aluminium
vi)	Densely populated manufacturing regions where skilled but relatively cheap female labour is easily available.	Woollen textile
vii)	Availability of capital for making investments in research establishments and highly specialized technical staff.	Silk and rayon
viii)	Vicinity of hydel-power station where bauxite can be brought easily.	Chemical fertilizers
ix)	Coal-fields, oil-fields, hydel-power stations or ports where raw materials like phosphates, potash, and nitrates can be easily collected and the finished products distributed.	Chemical
x)	Where abundant coke and limestone is available in addition to the necessary mineral-ore.	Cement

Finding Out

Find out all that you can about the progress being made by the following industries in India :

i) automobiles
ii) rolling stock—railway engines, coaches and wagons.
iii) shipbuilding
iv) aircraft manufacturing.

Cartographic Work

i) Draw a map of India and show the iron and steel plants, automobile production centres, plants engaged in the production of rolling stock, shipbuilding yards, and aircraft manufacturing centres. Write a suitable note below the map.

ii) Show graphically the trends in production of cars, trucks, railway engines, coaches, wagons and merchant ships in India during the last five years.

Picture Reading

Much of our progress in various fields depends upon iron and steel. What occupations and economic activities of man would have been handicapped in the absence of large-scale production of iron and steel? Study the pictures in the book to answer this question.

Films Available

i) Story of Steel. No. 669.1; 11 mins; Hindi/English; D.A.V.E.
ii) Iron and Steel. No. 669.1; 9 mins; English; D.A.V.E.
iii) Steel. No. 1255; 35 mins; English; B.I.S.
iv) Steel for Progress. No. 672; 19 mins; Hindi; D.A.V.E.
v) Jungle to Steel Town. No. 2541; Part 1—38 mins; and Part 2—28 mins; English; B.I.S.
vi) Rourkela. No. 326; 20 mins; Hindi/English; Embassy of the Federal Republic of Germany.
vii) Iron and Steel Making in Japan. No. 10; 50 mins; English J.I.C.
viii) Fire on the Ruhr. No. 209; 54 mins; English; Embassy of the Federal Republic of Germany.
ix) A Building of a Liner. No. 623.8; 8 mins; silent; D.A.V.E.
x) Seawards the Great Ships. No. 2190; 29 mins; English; B.I.S.
xi) Modern Shipbuilding. No. 12; 25 mins; English J.I.C.
xii) Osaka (Industrial Centre of Japan) No. 28; 25 mins; English; B.I.C.
xiii) For Better Travel. No. 625.26; 11 mins; Hindi D.A.V.E.
xiv) Rolling Stocks. No. 22; 25 mins; English D.A.V.E.
xv) Metal in Harmony. No. 2291; 21 mins; English; B.I.S.

Further Readings

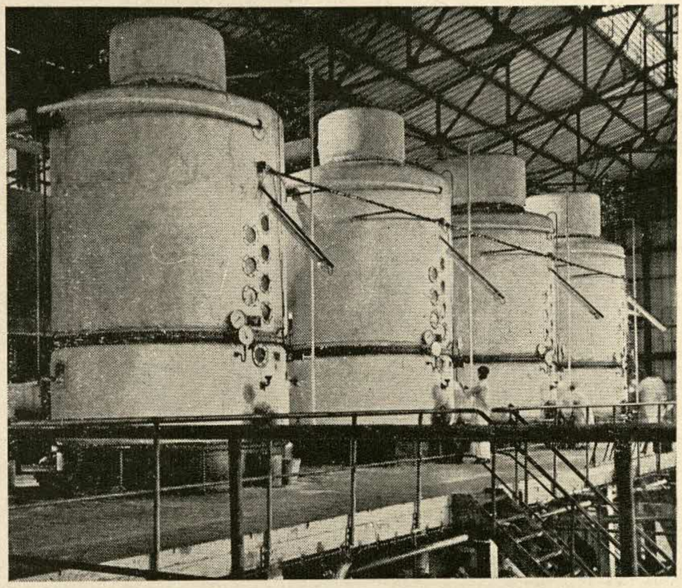
ABBOTT, R., *Man's Work and Needs.* University of London Press, Ltd., London, 1960. Pp. 193-218.

*BENGTSON, N.A., and VAN ROYEN W., *Fundamentals of Economic Georgraphy.* Prentice-Hall, Inc., Englewood Cliffs, N.J., 1956. Pp. 461-477 and 542-547.

*JONES, C.F., and DARKENWALD, G.G., *Economic Geography.* The Macmillan Company, New York, 1954. Pp. 440-459, 465-472 and 477-491.

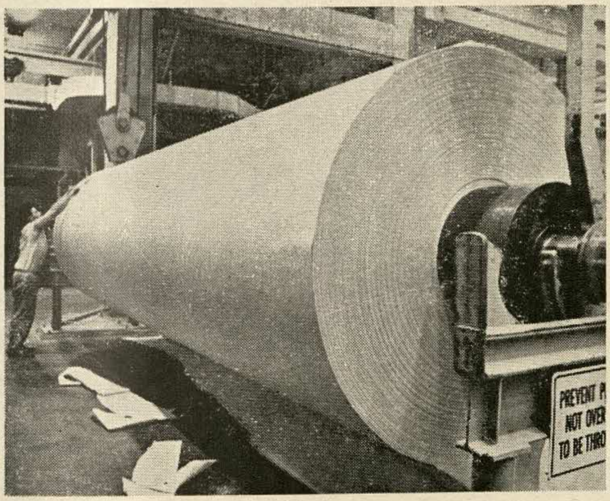
KOHN, C.F., and DRUMMOND, D.W., *The World Today.* McGraw-Hill Book Company, Inc., New York, 1963. Pp. 112-124.

*SMITH, J.R., PHILLIPS, M.O., and SMITH, T.R., *Industrial and Commercial Geography.* Holt, Rinehart and Winston, New York, 1960. Pp. 340-379, and 441-459.



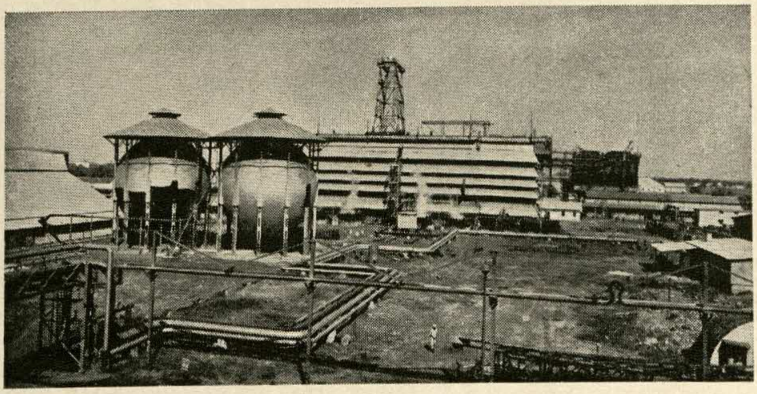
58. VACUUM PANS FOR THE CRYSTALLIZATION OF SUGAR (*Courtesy: Photo Division, Ministry of Information and Broadcasting New Delhi.)*

The final stage of evaporation accompanied by crystallization of the highly concentrated purified syrup takes place in these vacuum pans. Each pan turns out 10 *to* 30 *tons of crystal sugar in a single boiling operation requiring* 3 *to* 12 *hours. Find out how vacuum pans help crystallization.*



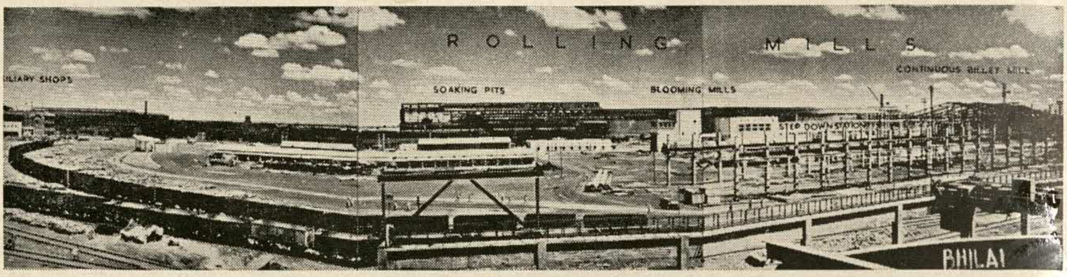
59. A ROLL OF NEWSPRINT AT A PULP AND PAPER MILL IN CANADA (*Courtesy: National Film Board of Canada.*)

The pulp and paper industry in Canada stands first in value of production, exports, total wages paid and total capital invested. It is the largest consumer of electric power. Canada is the leading producer of newsprint in the world. What factors help it to enjoy this position?



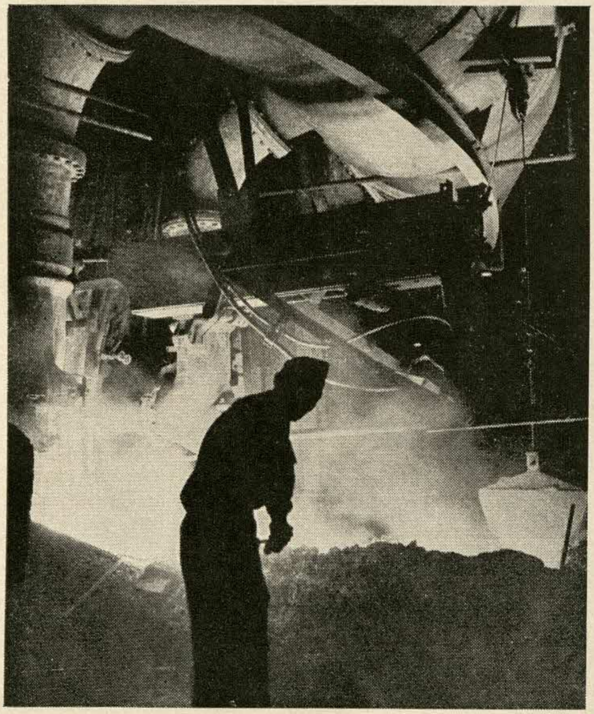
60. AMMONIA PLANT OF SINDRI FERTILIZER FACTORY (*Courtesy: Photo Division, Ministry of Information and Broadcasting New Delhi.*)

The plant converts 2,800 *cubic metres of gas available from the coke oven plant into ammonium sulphate. In* 1962, *it produced* 240,000 *tons of this fertilizer. How does this fertilizer plant differ from the one at Nangal?*



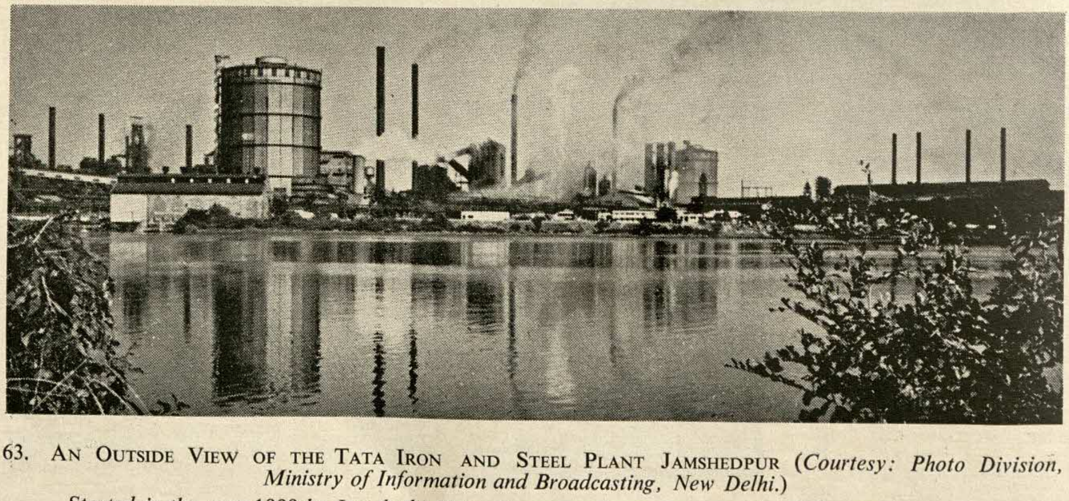
61. A PANORAMIC VIEW OF THE BHILAI STEEL PLANT (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

Originally, its capacity was one million tons of ingot, which has been now increased to 2.5 million tons. It is a state-owned plant built with Soviet collaboration. In what products does the plant specialize?



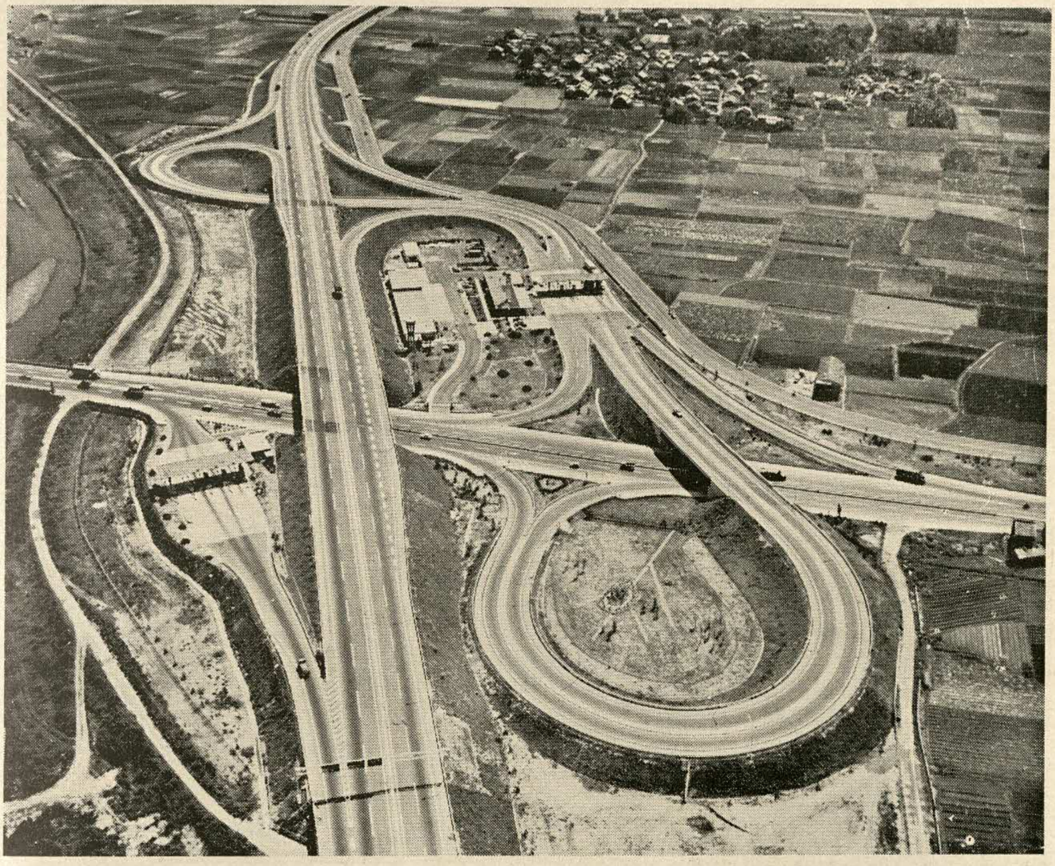
62. IRON-ORE BEING SMELTED AT TATA IRON AND STEEL PLANT, JAMSHEDPUR (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

The furnace is filled with layers of coke, limestone and iron-ore. Why is it called a blast furnace?



63. AN OUTSIDE VIEW OF THE TATA IRON AND STEEL PLANT JAMSHEDPUR (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

Started in the year 1908 *by Jamshedji Tata, it now produces iron, steel and locomotives. Its capacity is* 2,000,000 *tons of ingots to be rolled into* 1,500,000 *tons of finished steel. Why is Jamshedpur a good site for Steel plant?*

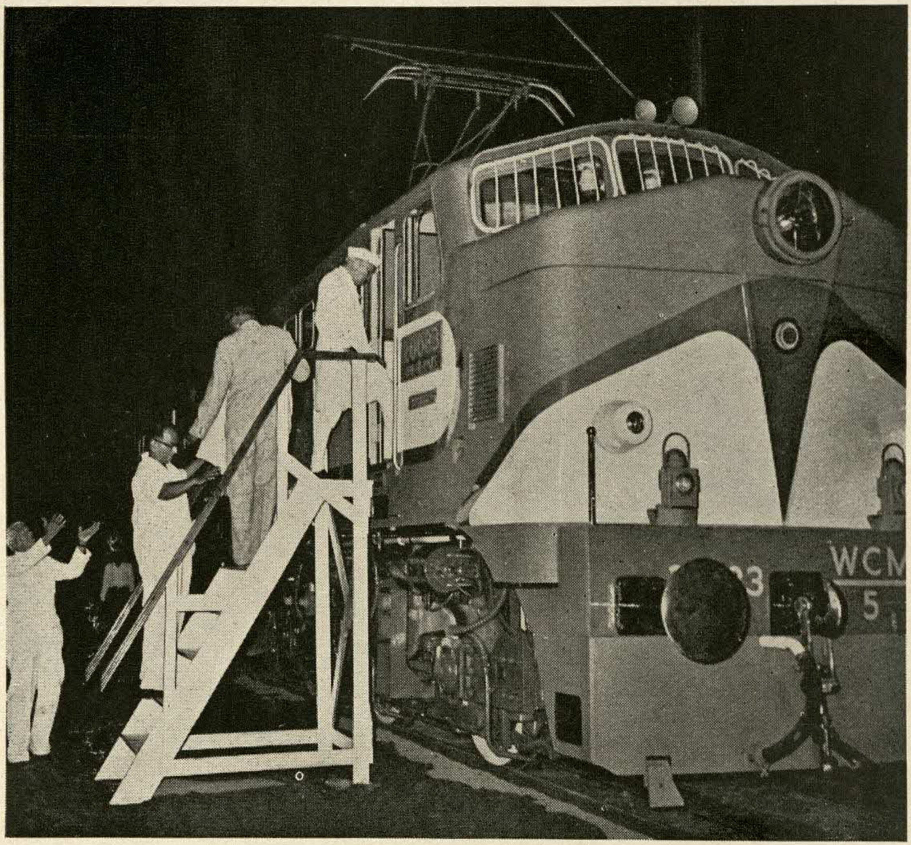


64. A FREEWAY SOUTH OF KYOTO IN JAPAN (*Courtesy: Japan Information Centre, New Delhi.*)

Study carefully how these well-planned roads promote smooth and rapid flow of trade and traffic. What makes you think that this is a densely populated region where intensive agriculture is practised? Which name would you prefer for such roads—a "Freeway ", an "Expressway" a"Through way" or a "Turnpike"?

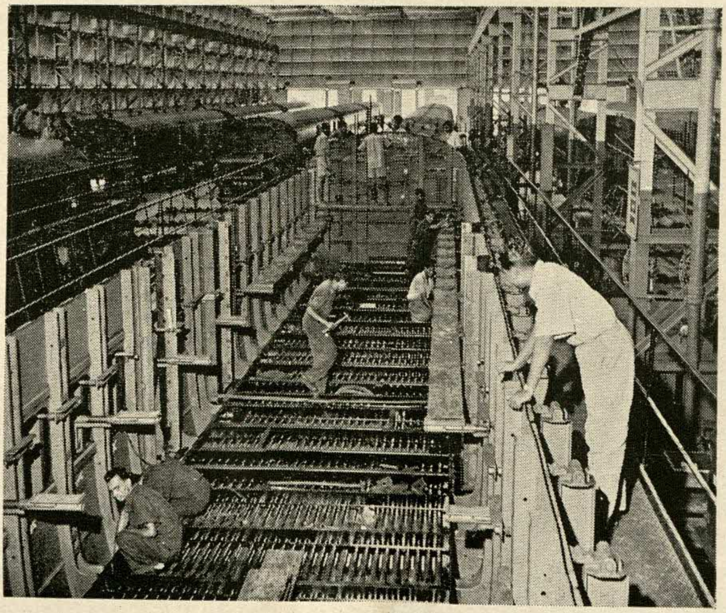
65. MOTOR CAR ASSEMBLY LINE IN FRANCE (*Courtesy: Embassy of France, New Delhi.*)

The Simca cars are rolling out of the assembly line of the Poissy Plant in France. France manufactured 987,500 *passenger cars in* 1961, *whereas in* 1962, *its production rose to* 1,278,000. *Which countries are ahead of France in the automobile industry?*



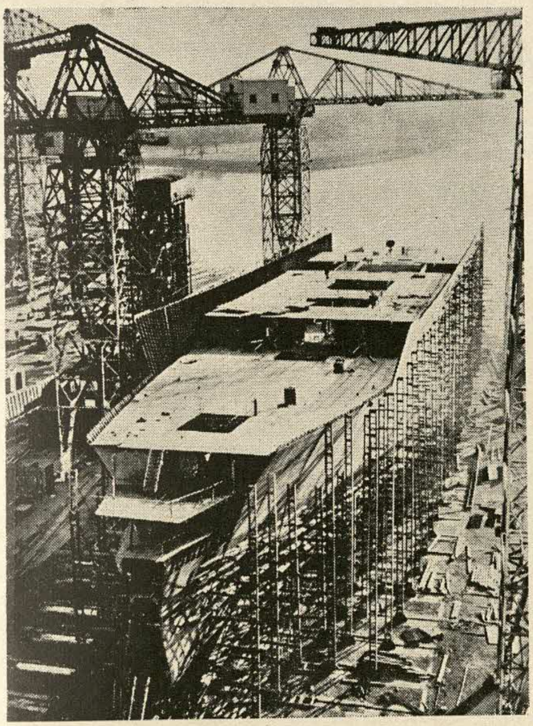
66. THE FIRST ELECTRIC LOCOMOTIVE MANUFACTURED AT CHITTARANJAN (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

The Late Prime Minister Jawaharlal Nehru commissions the first electric locomotive, 'Lokamanya . What is the annual production capacity of rolling stock industry in the country?



67. A COACH BUILDING SECTION OF THE INTEGRAL COACH FACTORY, PERAMBUR (*Courtesy : Photo Division, Ministry of Information and Broadcasting New Delhi.*)

In 1962-63, *the factory produced* 600 *unfurnished coaches. How does an integral coach differ from any other coach?*



68. GIANT PASSENGER-LINER TAKES SHAPE IN SCOTLAND (*Courtesy: British Information Service, New Delhi.*)

A 25,000-*ton passenger-liner is being built in the famous Clydeside Shipyard at Glasgow. This region with* 30 *shipbuilding firms concentrates on passenger-liners and naval vessels. The super-liners Queen Mary and Queen Elizabeth were also built in this region. Why are they called luxury liners or floating hotels?*

69. TWO NEW SHIPS UNDER CONSTRUCTION AT VISHAKHAPATNAM (*Courtesy: Photo Division, Ministry of Information and Broadcasting, New Delhi.*)

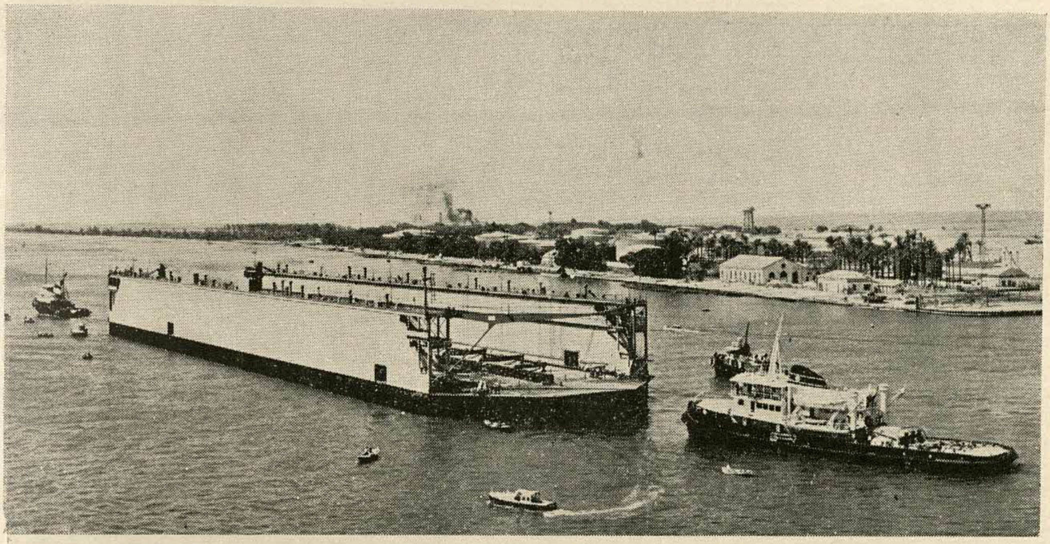
The first ship was built here in 1948. *By* 1963, *the total number of ships constructed was* 36 *with the aggregate tonnage of nearly* 200,000. *Which are the other two shipbuilding yards in India?*

70. Toronto Airport in Canada (*Courtesy: National Film Board, Canada.*)

A modern airport of Canada situated close to the United States. Rapid progress in civil aviation has opened up new areas enabling the nation to use its widely scattered resources, very often located in inhospitable regions. How have advances in meteorology helped rapid growth of civil aviation?

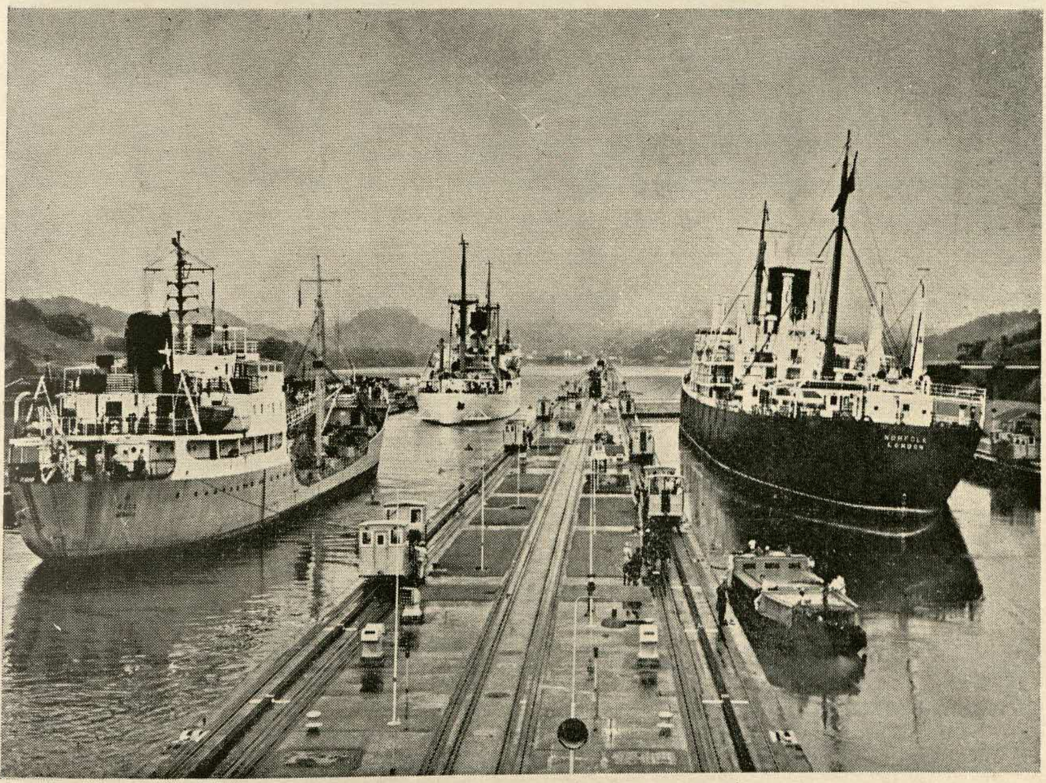
71. San Francisco, the Largest Land-locked Harbour (*Courtesy: U.S.I.S. New Delhi.*)

With an area of 115 *square kilometres it is the largest land-locked harbour in the world. It is known as the Western Gateway of the United States. The bridge in the background is called the Golden Gate Bridge. The bridge in the foreground across the bay is* 13.6 *kilometers long. What factors are responsible for the rapid growth of this town ?*



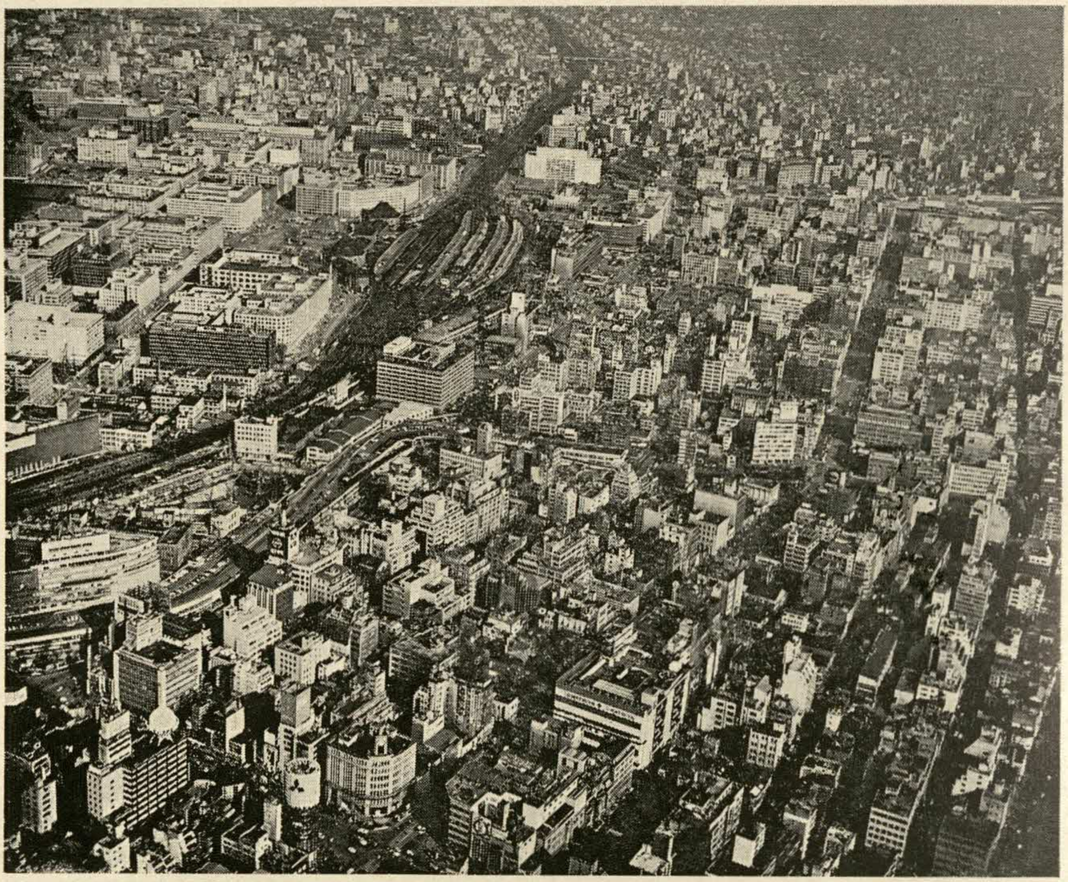
72. A NEW FLOATING DOCK IN THE SUEZ CANAL (*Courtesy: Embassy of the U.A.R.*)

The lifting capacity of the dock is 25,000 *tons. It is capable of servicing vessels of more than* 40,000 *tons passing through the canal. Compare the landscape with that of the Panama Canal. Why is India interested in the smooth functioning of this canal?*



73. BALBOA HEIGHTS IN THE PANAMA CANAL ZONE (*Courtesy: U.S.I.S., New Delhi.*)

About 9,000 *ships make the eighty-kilometre transit of the canal each year. A ship takes about* 7 *to* 8 *hours. About* 45 *million tons of cargo pass through the canal. How do the locks in this canal function?*

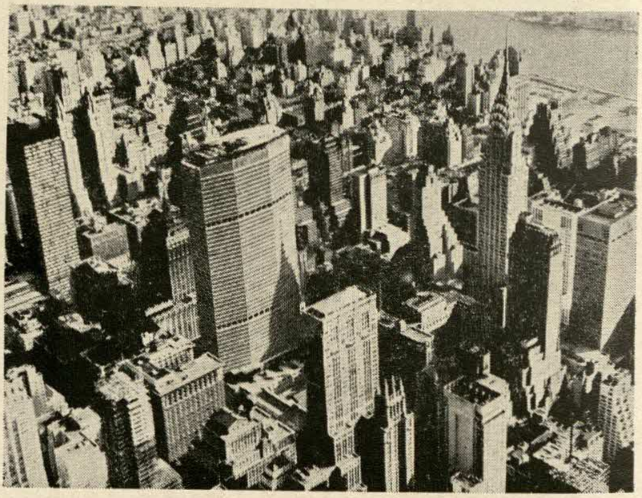


74. Aerial View of Tokyo (*Courtesy: Japan Information Centre, New Delhi.*)

Tokyo today is the largest city of the world. In 1960, its population was 8,302,565. The city is the centre of Japan's political, economic and cultural life. Together with the port city of Yokohama it is the nation's largest industrial complex. What made this city grow out of all proportion?

75. Skyscrapers of New York (*Courtesy: U.S.I.S., New Delhi.*)

The airview shows the "downtown" of New York—the business and commercial centre of the metropolis, the largest urban agglomeration in the world with a population of 10,694,633 in the year 1960. How does this city differ from Tokyo?



CHAPTER 9

Transport and Communication

THE need for carrying goods or persons from one place to another has been felt from the earliest times. Even in the simple barter system of trade, the things to be exchanged between the two parties to the mutual advantage of both had to be carried from one place to another.

In the complex pattern of modern trade and commerce, the importance of transport cannot be overemphasized. Raw materials have to be taken to factories for conversion into manufactured products. The finished goods, in turn, have to be despatched to markets, far and near, for distribution. The distance to be covered in the process is a factor of high economic significance.

Regional specialization, which generally results in low costs of production, will not be possible without an efficient system of transport. How would Assam specialize in the production of tea if its large surplus produce could not be promptly despatched to different parts of the world? How could the Integral Coach Factory at Perambur, in Madras, manufacture integrated coaches without the supply of iron and steel from the Chhota Nagpur region or elsewhere? The steel plants, in their turn, have to depend upon railways and other means of transport for the supply of huge quantities of heavy and bulky raw materials coal, iron-ore, limestone, and manganese.

An efficient transport system, therefore, is a must for specialization, whether it is agriculture or industry.

Life in the great metropolitan cities of our times would come to a standstill if the lines of transport and communication were dislocated even for a single day. Never were our towns and villages so interdependent on each other as they are today. An area self-sufficient in all respects is but a dream of the past.

Development of Transport

Primitive man carried things on his head or on his back or dragged them along the ground. Some parts of the world are still clinging to this stage where man continues to be the chief beast of burden.

Then came the next stage when man succeeded in domesticating animals like the horse, the camel, the ox, the goat, or the donkey to carry him and his belongings. A single person could look after a number of such animals they, could be made to carry much more goods than what he could.

The caravans of camels in deserts, the yaks in the high Himalayas, and llamas in the Andes, still continue to be the only convenient means of transport. The elephant in the tropical rain forests and the reindeer in the tundra can hardly be replaced by any modern means of transport in their respective areas. The sure-footed mule is the only reliable means in the difficult mountain terrain. Our *jawans* defending our northern frontiers occasionally value a mule more than a jeep, or an aeroplane.

The next revolutionary invention in transport was the wheel. Wheeled carts drawn either by man or animal further facilitated the transport of more and heavier goods over longer distances than ever before.

Man-drawn rickshaws, the pedal-driven cycle rickshaws, wheel-barrows bullock-carts, horse-carriages and tongas are even today the common means of transport in certain parts of the world, particularly where the population is dense and the standard of living is very low.

Since very early times, man has used the running water of streams and rivers for carrying him and his goods. Logs of timber cut in the forests along the mountain slopes are brought down by streams and rivers. Canoes hewn out of single logs and rafts made by tying logs together were the first simple boats.

Then came the bigger boats with oars and sails. The sail-ships of the fifteenth century could go round the world.

Today, thousands of tramps loaded with heavy goods and fast-moving luxury ocean liners carrying passengers ply on the high seas.

Man had long dreamt of floating in the air like a bird and had even succeeded in going up in the air in a basket tied to a balloon filled with a light gas like hydrogen. These early successes were followed by the much more spectacular invention of the aeroplane. Today man is on the threshold of travelling, through rockets and spaceships, to the Moon and perhaps to Venus and Mars as well.

Modern Means of Transport

Nowadays we have a large variety of means of transport at our command. They are cars, buses, jeeps, trucks, railway trains, ocean-liners, tramps, helicopters, and aeroplanes. These fast, powerful and highly efficient means of transport were the result of the Industrial Revolution initiated by Watt's steam engine.

Our complex transport system is classified into three categories : transport by land, water, and air.

Transport by land depends upon a network of roads and railways. Transport by water makes use of navigable rivers and canals besides the high seas. Transport by air requires big airports equipped with efficient means of communication. The most characteristic feature of the modern means of transport is that they carry a much larger load over longer distances in far less time than ever before.

TRANSPORT BY LAND

The inventions of the 'iron horse', that is the locomotive, and the motor car represent turning points in land transport with far reaching consequences in our social and economic life. Many parts of the world are criss-crossed by surfaced roads and railways, very often forming intricate webs around a few focal points like Chicago, New York, Paris, Moscow, and Delhi.

Road Transport

The introduction of motor cars and trucks has revolutionized road traffic. These vehicles are fast replacing the bullock-carts in our country as they have already done in the West.

Trucks require good roads preferably metalled. The loading and unloading of a truck is not costly. A truck can reach practically any place provided the road is tolerably good. Unlike the railways, a truck can go to a farmer or a merchant to his very doors. On the other hand, the farmer or the merchant has to go either by cart or by truck to the railway station to despatch or receive his consignment. The truck is thus ideal for individual needs and can be used with greater frequency over short distances.

The relative cheapness of motor or railway travel depends upon local factors. Motor transport is generally convenient for short distances, whereas a railway travel is suitable for long ones.

One more factor in favour of motor transport is that it can climb steeper slopes than the railway. In a hilly terrain, truck or car transport has, therefore, a distinct advantage.

Unlike railways, motor transport involves less expenditure both in initial investment in roads and vehicles and in their upkeep. Motor transport is particularly more suitable where the traffic to be handled is small.

The number of cars and trucks in use in India is very low. In 1961, we had only 309,000 passenger cars and 206,000 commercial vehicles (Fig. 64). How do these figures compare with some of the countries like the United States and Canada?

Highways are roads joining distant places. Modern highways are well-surfaced metalled roads, generally avoiding going through towns or villages. They usually avoid sharp curves so that the vehicles plying on them may maintain a good speed.

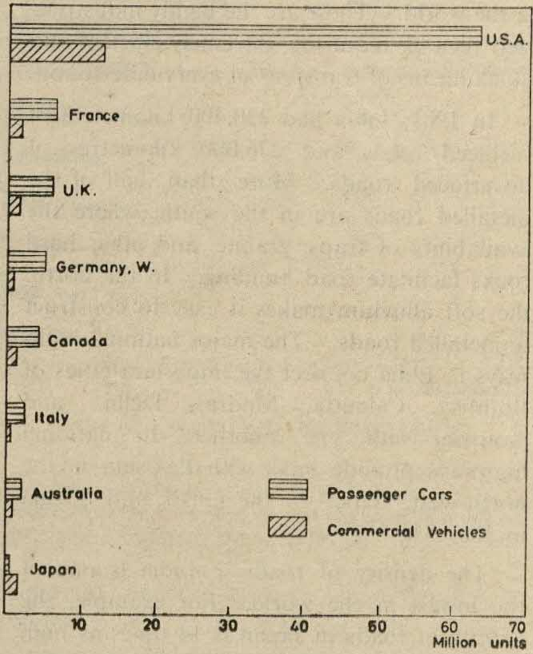


Fig. 64. Motor Vehicles in Use (1961)

Note the dominating position of the United States which alone accounts for nearly 58 per cent of the cars and trucks in use in the world excluding the Soviet Union and other communist countries. Work out the number of passenger cars per thousand people in various countries.

Highways in the **United States, Europe,** and **Japan** are wide enough to allow at least four vehicles to travel, two abreast in each direction. Some of the 'freeways' recently constructed in the United States are wide enough to allow six vehicles abreast in each direction. Cross-roads are avoided by providing overhead links where one turns only in one direction. In many western countries, a definite high speed of 100 to 110 kilometres per hour has to be maintained by every vehicle plying on the freeways to ensure the smooth flow of traffic. (*See* picture 64.)

Eastern United States and Western Europe have the densest network of highways in the world. These are the highly industrialized regions requiring extremely efficient and quick means of transport of every description.

In 1961, **India** had 230,400 kilometres of surfaced roads and 376,000 kilometres of unsurfaced roads. More than half of the metalled roads are in the south, where the availability of traps, granite, and other hard rocks facilitate road building. In the north, the soft alluvium makes it easy to construct unmetalled roads. The major national highways in India connect the important cities of Bombay, Calcutta, Madras, Delhi, and Amritsar with one another. Its national highways provide links with Pakistan in the north-west, Tibet in the north and Burma in the east.

The density of roads in India is one of the lowest in the world. For example, the density of roads in Japan is 14 times as high as that of India. The ratio beween the total population and the length of the roads in India is still lower. For example, such a ratio in the United States is thirty-three times higher than what it is in India.

India has a phased programme of expansion of its roads. It needs to increase the total length of its roads considerably, widen the existing roads, and provide overhead links. Our roads have to cope with the rising demands of economic development and to step up our defence potential, particularly by constructing new roads along our borders, specially in the north and north-east.

Sometimes motor transport seems to compete with railway transport. This is noticed in the United States, where both motor transport and railways are privately owned. In India also, railways feel the competition from motor transport in some areas. But since Indian railways are government owned and many States have taken over road transport, the two can work in co-ordination and not in competition.

Railways

Nothing surpasses railways as a means of transport on land when heavy freight has to be carried over long distances. They carry raw materials to industrial areas and distribute finished goods inside the country or carry them to ports for export. They handle imports for their speedy distribution. They carry large amounts of foodgrains from one part of the country to another.

Countries like India were already occupied and well settled before the advent of railways. But the countries of the New World, especially Canada, were opened up by the railways. In the Canadian prairies railways preceded the settlers. The utilization of economic resources of the interior parts of the United States, Canada, Australia, Argentina, Brazil, and Siberia was made possible only by the railways.

In the monsoon lands like India, if the famines have become a thing of the past, it is largely because of the railways.

Railways are highly important from the strategic and defence point of view. The close railway network in India established by the British owes its origin to strategic considerations. They serve as supply lines for our armed forces stationed on the frontiers. A dense and efficient railway network often increases the mobility and striking power of the defence forces. Thus railways are important both in peace and in war, for defence as well as development. They are, indeed, the most important lifelines of a nation.

Besides promoting trade and commerce, and defence and development, they bring people close to one another. A close railway network is also an indication of the prosperity of the region where it exists.

Railway construction often depends on the nature of the terrain and also on climate. There are fewer railway tracks across mountainous parts and in areas of heavy rain or snow. In such regions construction as well as maintenance of railways is expensive. Railways follow a very gentle gradient, often less than 2.5 per cent. Nevertheless, the railroads have been built across the Rockies, the Andes, the Alps, and the Western Ghats, the Vindhyas and the Satpuras in India, and lines of communication have been established between both sides of the mountains.

The speed and capacity of the railways to carry load is being increased by constructing multiple tracks, ensuring low gradient or slope and gentle curves, stabillizing ballast, and installing modern electronic signalling system. Diesel and electric locomotives possess high traction power and better speed. The use of diesel engines saves coal. The gauge of the track is also an important factor. The broader the gauge, the greater is the capacity of the railways to carry load.

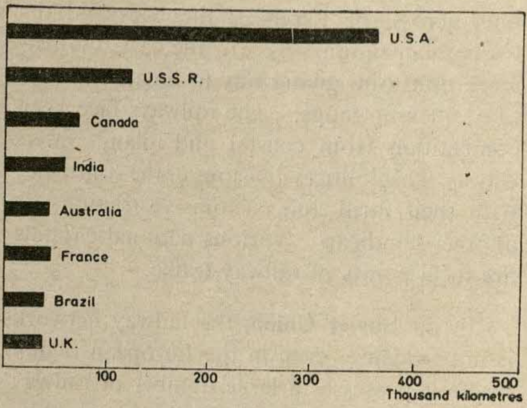


Fig. 65. Length of Railway Lines

Note the countries with a large network of railway lines and compare this diagram with the next. Re-arrange the countries in this diagram in order of the density of their railway lines.

The densest railway network is found in Western Europe and in Eastern Central North America, that is in the highly industrialized regions of the world. In Europe, the countries of Belgium, the United Kingdom, West Germany, and France have a high density of railway lines. For example, the railway density of Belgium is nearly eight times higher than that of India (Fig. 66).

The railway network of Western Europe is more or less of a uniform density. In the south it gives way to transmontane railway

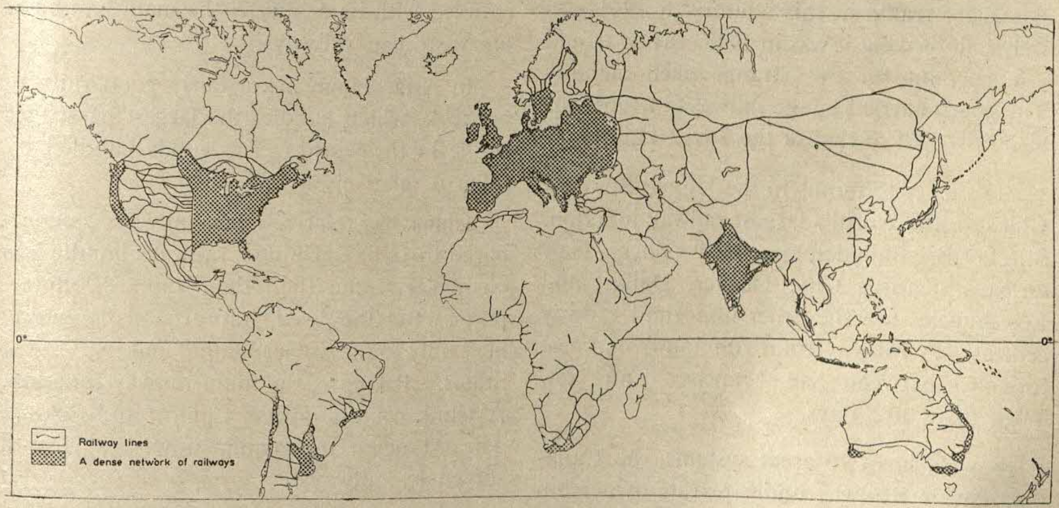


Fig. 66. Network of World Railways (After J.H. Bradley.)

Study carefully the areas with dense network of railways and compare them with the large areas poorly served by them. What inferences would you draw regarding industrialization, population and agriculture in such areas?

lines across the Pyrenees, the Alps and the Carpathian mountains. In the east, the network thins out, giving way to Soviet railways of a different gauge. The railways face keen competition from coastal and inland waterways. The political divisions of the continent, with their tariff and customs restrictions, is another handicap. Various national capitals are focal points of railway traffic.

In **the Soviet Union,** the railway network is not so dense, even in the European region where it possesses a large number of railway lines. The Trans-Siberian Railway, a double-tracked railway line joining Moscow and Vladivostok, is the longest in the world. It is further connected to Leningrad in the west. The Soviet railways are the chief means of transport for carrying passengers as well as goods, as the Soviet Union is poorly served by coastal or inland water-ways. They lead the world in carrying goods and stand second to Japan in passenger transport.

In **North America,** the eastern half of the United States possesses a dense network of railway lines. It is interesting that the passenger traffic in this country in 1961 was only half of what it was in 1948. How would you account for this strange phenomenon? The goods carried by the railways in 1961 was also only half of that of the Soviet Union.

The chief terminus in the United States is Chicago, the world's largest railway junction. St. Louis, Philadelphia, New York, New Orleans, Kansas City, Denver, Dallas, and Los Angeles are the other important railway centres. A railway train running from coast to coast between San Francisco and New York takes five days.

Canada has two great systems, the Canadian Pacific Railway under private ownership and the other the Canadian National Railway owned by the government. They run from coast to coast between Vancouver on the Pacific to Montreal and Quebec on the St. Lawrence extending up to Halifax and St. John on the Atlantic Coast. These railways carry much more goods than passengers.

In **South America,** Argentina possesses a dense railway network, whereas Chile has a peculiar longitudinal railway pattern. The Trans-Andean Railway links Valparaiso on the Pacific with Buenos Aires on the Atlantic. Some of the railway lines built in the Andes are among the costliest in the world as they negotiate the most difficult terrain with the help of a large number of bridges and tunnels. These lines are among the highest in the world.

The development of railways in **Africa** is retarded because of the mountains and high plateaus, thick equatorial forests and a large number of political barriers. The famous Cape-Cairo Railway of the nineteenth century is yet an unfulfilled dream.

In **Australia,** the railways are mostly along the east, south-east and south-west coast. It is often said that most of the Australian people have an access to railways, whereas most of the land does not. The desert coupled with its aridity is the main handicap of Australian railways.

In **Asia, Japan** has a fairly good railway network, which handles the largest passenger traffic in the world. The goods handled by them is relatively low.

China has relatively few railways as compared to India. Chinese railways handle less passenger traffic than their Indian counterparts. But they carry more goods, standing next only to the Soviet Union, and the United States. Peking is the main railway junction. A trunk route connects Canton and Peking. The Manchurian region, however, is well served by railways.

In **India,** the first railway line was constructed between Bombay and Thana in the year 1854. Since then there has been a great expansion of railways in this country. The total length of our railway lines is 55,520 kilometres. Our railways are the principal means of our national transport, handling about four-fifths of the goods and seven-tenths of the passenger traffic. In 1961-62, it carried more than 1,712 million passengers and 1,618 million tons of goods. We possess the largest railway network in Asia standing next only to the United States, the Soviet Union, and Canada. The density of our railway network is, however, low as compared to that of Western Europe and the United States (Fig. 65).

The net-ton-kilometre and the passenger-kilometre are the two units often used to measure the services rendered by railways. A ton of goods carried over the distance of a kilometre is known as a *net-ton-kilometre;* and when a passenger is carried over a kilometre it is called a *passenger-kilometre*.

Indian railways stood third in 1961, accounting for 82,000 million passenger-kilometres as against 195,000 million passenger-kilometres by the Japanese railways and 176,000 million passenger-kilometres by the Soviet railways. (*See* Appendix IX.)

Indian railways recorded 76,000 million net ton-kilometres and rank fifth in the world. The Soviet Union led the world with 1,566,000 million net-ton-kilometres. The Indian railways use three different gauges: the broad gauge (1.69 metres), the metre gauge and the narrow gauge (.77 metre). Most of its trunk routes have multiple tracks. For a long time electric railway trains were confined only to the Bombay-Poona region. Recently Indian Railways have made progress in extending electrification on trunk lines between Calcutta-Mughalsarai (Eastern Railway), Igatpuri-Bhusawal (Central Railway) and around Madras (Southern Railway). This will not only increase the efficiency of railways but also save coal for more profitable industrial purposes.

Indian railways are owned and run by the Union Government. They have been organized into different zones. They are constantly trying to cope with the rising demands of the rapid industrialization of our country. New tracks are being laid; at places, single tracks are being converted into double tracks; more and more diesel engines are being used to increase the speed and load-carrying capacity of the trains. Indian railways, however, still remain one of the most over-crowded railways in the world.

WATERWAYS

Transport by water is much more important than what we generally imagine. Nearly three-fourths of the earth's surface is covered with water. The oceans and seas being interconnected, they serve as unbroken links between landmasses.

Oceans promote international trade and commerce, for they offer a free highway which requires no investment whether in building routes, or in their upkeep; except for the dredging of harbour channels.

Deep-sea water easily bears the weight of big ships and their cargo, because of the buoyancy of water. It, moreover, offers little friction. This means a great saving in power or fuel spent in overcoming frictional resistance. It is common experience that a horse can easily draw a canal barge weighing as much as 40 tons, whereas on a level road it cannot pull a two-wheeled cart weighing more than a ton.

The major and only drawback of water transport is its slow speed. This is, however, compensated by the low costs of transport per unit. In fact, the bulkier the goods, the greater is the tendency to carry them by water.

Transport by water comprises inland waterways and ocean routes.

Inland Waterways

Navigable rivers, lakes, and canals constitute inland waterways. Rivers and canals restrict the traffic by their narrowness, depth, and gradient. Slow-moving rivers allow traffic both up and down the river.

Large rivers, like the Nile, the Amazon, the Mississippi, and the Yangtze are very useful as inland waterways because of their length, width, depth and low gradients. Even rivers which are not so long like the Rhine, the Danube, the Volga, the Ganga, the Brahmaputra, and the Irrawaddy are also very busy water-ways.

The delta regions of the Mississippi, the Rhine, the Po, the Nile, the Yangtze, and the Ganga-Brahmaputra possess a natural intricate network of interconnected waterways formed by the distributaries of these rivers.

Many of the countries of the world have interlinked their navigable rivers by constructing canals providing thereby interconnected networks of inland waterways. West Germany, France, and the Soviet Union have such well-developed networks.

Like the rivers, many of the larger lakes are also useful for inland navigation. The Great Lakes between the United States and Canada, together with the St. Lawrence waterway is the largest and the busiest inland waterway of the world, although it is frozen for about four months in winter, every year.

The St. Lawrence waterway serves the most important industrial region of North America. It helps to move heavy and bulky commodities like coal, iron-ore, limestone, petroleum, and grains, all of which demand cheap transport. About 95 per cent of the freight moving along this route consists of these bulky commodities.

Duluth, Toledo, Buffalo, Chicago, Cleveland, Two Harbors and Fort William—Port Arthur are the important ports on the lakes.

Ocean Routes

Today, oceans are spanned by thousands of tramps and liners. Whereas the *liners* operate on regular routes following their schedule of sailing, the *tramps* have no regular routes or any fixed schedule. Liners carry passengers, mail and goods which demand fast transport. Tramps carry goods, visiting any port where cargo can be obtained. They move at a speed of about 10 knots or nearly 18 kilometres an hour.

North Atlantic Sea Route—The vessels follow the great circle route except where they deviate only to avoid the fog and icebergs near Newfoundland. The American ports—Quebec, Montreal, Halifax, St. John, Boston, New York, Philadelphia, Baltimore, Charleston and New Orleans—trade with the European ports—Glasgow, Liverpool, Manchester, Southampton, Plymouth, Bristol, London, Oslo, Rotterdam, Bremen, Hamburg, Le Havre, Bordeaux, and Lisbon (Fig. 67).

The east-bound traffic is more than the west-bound. Grain, lumber, wood-pulp, dairy produce, petroleum, sugar, cotton, meat, sulphur, phosphate and manufactured goods move towards the European ports. The liners and tramps are able to secure pyrites, chalk, potash, pulp, newsprint, china clay, and manufactured goods. Many tramps call at South American ports before returning to the ports of the United States and Canada for want of return cargo.

South Atlantic Sea Route—The major traffic takes place between Europe in the north-east and Brazil, Uruguay, and Argentina in the south-west. The Europe-bound freight comprises wheat, barley, oat, rye, corn, flax-seed, cotton, coffee, sugar, wool, hides and skins, beef, and frozen meat. The return cargo generally consists of iron and steel, railway equipment, machinery, textiles, chemicals and other manufactured goods.

The Cape Route between Europe and Africa further extends to East African countries and Australia. Cocoa, palmoil, gold, diamonds, copper, meat, wool, ostrich feathers, wool, hides and skins, sugar, and

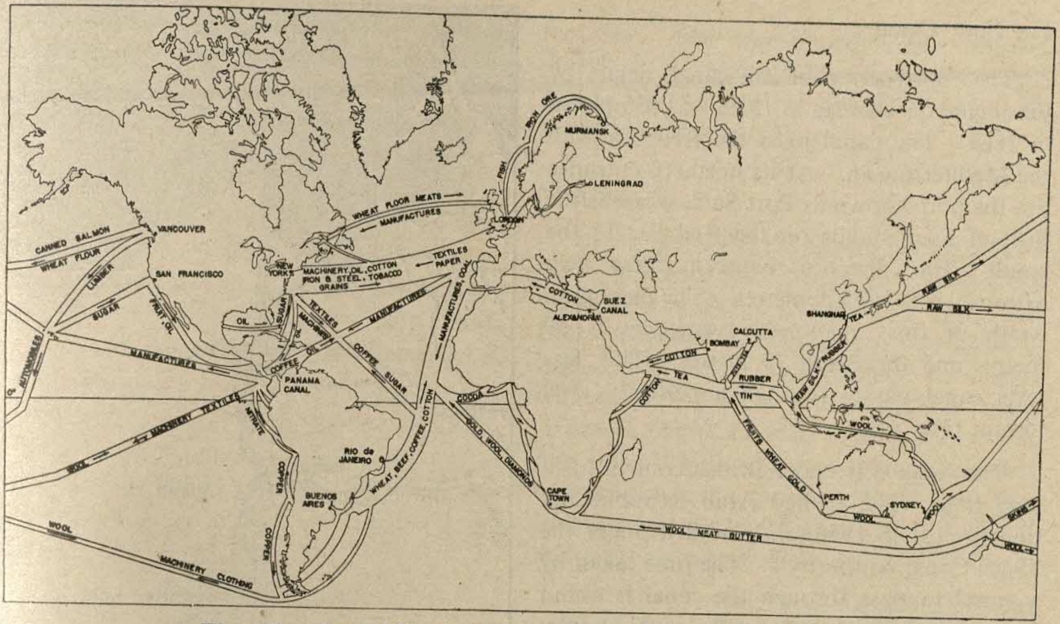


Fig. 67. **Ocean Trade Routes** (After J.H. Bradley.)

Note the major ocean routes shown in the map. The width of the routes is proportional to the tonnage moving along it. Also note the prominent commodities moving along these routes. What makes the Atlantic ocean route the busiest in the world?

corn move towards European ports. The Australian goods consisting of grains, meat, flour, jarrah wood, and wool, also reach Europe by this route. European manufactures destined for South Africa, and Australia also follow this route.

It is significant that there is little trade among the southern continents themselves. How would you explain this?

The Mediterranean Route—This route pierces the heart of the Old World as it were, and serves its most populous regions. Oil, grains, manganese, corn, cotton, tobacco, wool, hides and skins, citrous fruits, sulphur, jute products, sugar, rubber, tin, tea, oilseeds, coir, copra, raw silk, cotton piecegoods, and iron and steel move westward along this route towards Europe from various ports. Finished goods, textiles, machinery and engineering goods move towards the east.

The Pacific Ocean Routes—The most important is the route connecting the United States and Canada with Japan and East Asia. Lumber, wood-pulp, paper, wheat, oil, fertilizers, cotton, canned fruit, and salt move towards Asia. In return come silk, tea, cotton fabrics, drugs, art goods, and Japanese toys, and finished goods to the United States, and Canada.

The New Zealand-Panama Route is used by New Zealand, Australia, North America, and Europe. Pastoral and agricultural goods of Australia and New Zealand move towards North America and Europe in exchange for manufactured goods of these two continents.

There is a good deal of coastal traffic stretching from Alaska in the north to Chile in the south. Likewise, there is a considerable amount of trade along the eastern coast of Asia, from Singapore to Vladivostok.

The Suez Canal

The construction of this canal, begun by Ferdinand de Lesseps in 1859, was completed in 1869. The canal joins the Red Sea with the Mediterranean. At its northern entrance lies the port known as Port Said, whereas the port of Suez stands on the Red Sea in the south. The distance between these two extremeties is 162 kilometres. The maximum width of this man-made waterway is 59 metres and the depth 10 metres. This sea-level canal passes through a perfectly level terrain (Fig. 68).

The canal was under British control for a long time. The United Arab Republic nationalized it in 1956 and placed it under the "Suez Canal Authority". The time taken by a vessel to pass through the canal is about 10 to 12 hours. At present the canal handles about 45 ships a day. In 1958, about 15 per cent of the world's international trade passed through this canal. Efforts are being made to increase the capacity of the canal to handle traffic more speedily and efficiently. (*See* picture 72.)

The canal has shortened the voyage from Bombay to London by over 7,000 kilometres; Singapore to London by over 5,300 kilometres and from Calcutta to London by over 5,600 kilometres.

The Suez route is vital to the traffic between Europe and North America on the one hand and East African countries, Asia and Australia on the other.

It has an added strategic importance as it serves the oilfields of South Russia, Rumania, the whole of the Middle East, Indonesia, and Malaysia.

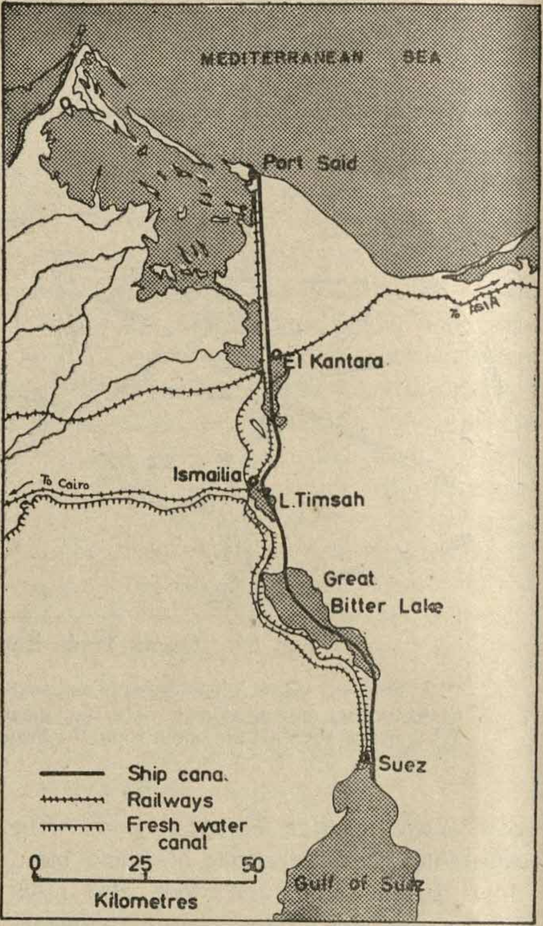


Fig. 68. The Suez Canal (Adapted from R. Abbott)

This canal is more important to ports like Bombay and Calcutta than to Singapore and other ports farther east. It is used more often by liners than tramps. Can you say why? Tankers account for more than half the tonnage passing through it. Why? How important is the canal for Indian trade?

The Panama Canal

The canal, lying between the continents of North America and South America, connects the two great oceans—the Pacific in the South and the Atlantic in the north. The canal, also known as a new gateway to the Pacific, is constructed, owned, and controlled by the United States. It was opened to traffic in 1914. The construction of this canal was a great feat of engineering and a grim fight against the forces of nature.

The canal is 65 kilometres in length and has a maximum depth of 12 metres. Its width varies from 30 metres to 90 metres. The highest point of the canal is twenty-five and-a-half metres above sea level. This made it necessary to construct locks in the canal to raise and lower ships (Fig. 69).

By letting water into the lock, the level of its water is raised enabling the ship to enter the next lock standing at a higher level. Similarly, the ship is lowered by letting out water from the lock so that the ship is able to enter the next lock lying at a lower level.

It takes about eight hours to pass through the canal. A ship is hauled by "mules", that is by engines running along the banks. The port of Colon is situated on the Atlantic, whereas the port of Panama stands on the Pacific. (*See* picture 73.)

The ships passing through the canal avoid the longer route around the Straits of Magellan. This results in saving both time and money. It helps to save 12,640 kilometres from New York to San Francisco and 14,240 kilometres from New Orleans to San Francisco. The distance saved between Liverpool and San Francisco is about 9,100 kilometres.

The route from the United Kingdom to New Zealand is slightly shorter *via* the Panama Canal, but the route to Sydney is shorter *via* Suez. The Panama route is preferred only for quick passenger and mail transport. But the Suez route is more attractive for the collection of passengers and cargo on the way.

The trade between eastern North America on the one hand and western United States, western Canada, western South America, Australia, and New Zealand on the other has increased owing to the Panama Canal. Japan is nearer to eastern North America by 5,400 kilometres as compared to the Suez route.

Most American ships use this route. A number of minerals—nitrates, copper, tin, ferro-alloys and petroleum—move towards the east. The west-bound cargo consists mostly of agricultural produce of eastern South America and the finished products of North America and Europe.

Shipping

In the year 1961, the **United States** claimed the largest merchant shipping, with a gross registered tonnage of 28.8 million tons. The **United Kingdom** followed it very closely with 28.6 million tons. **Norway** stood third with 18.7 million tons to its credit. A small African country, **Liberia,** ranked fourth with over 11.6 million tons. **Japan** had 9.8 million tons of merchant fleet and was followed by **Italy** and **France** with 7.2 and 7.1 million tons respectively.

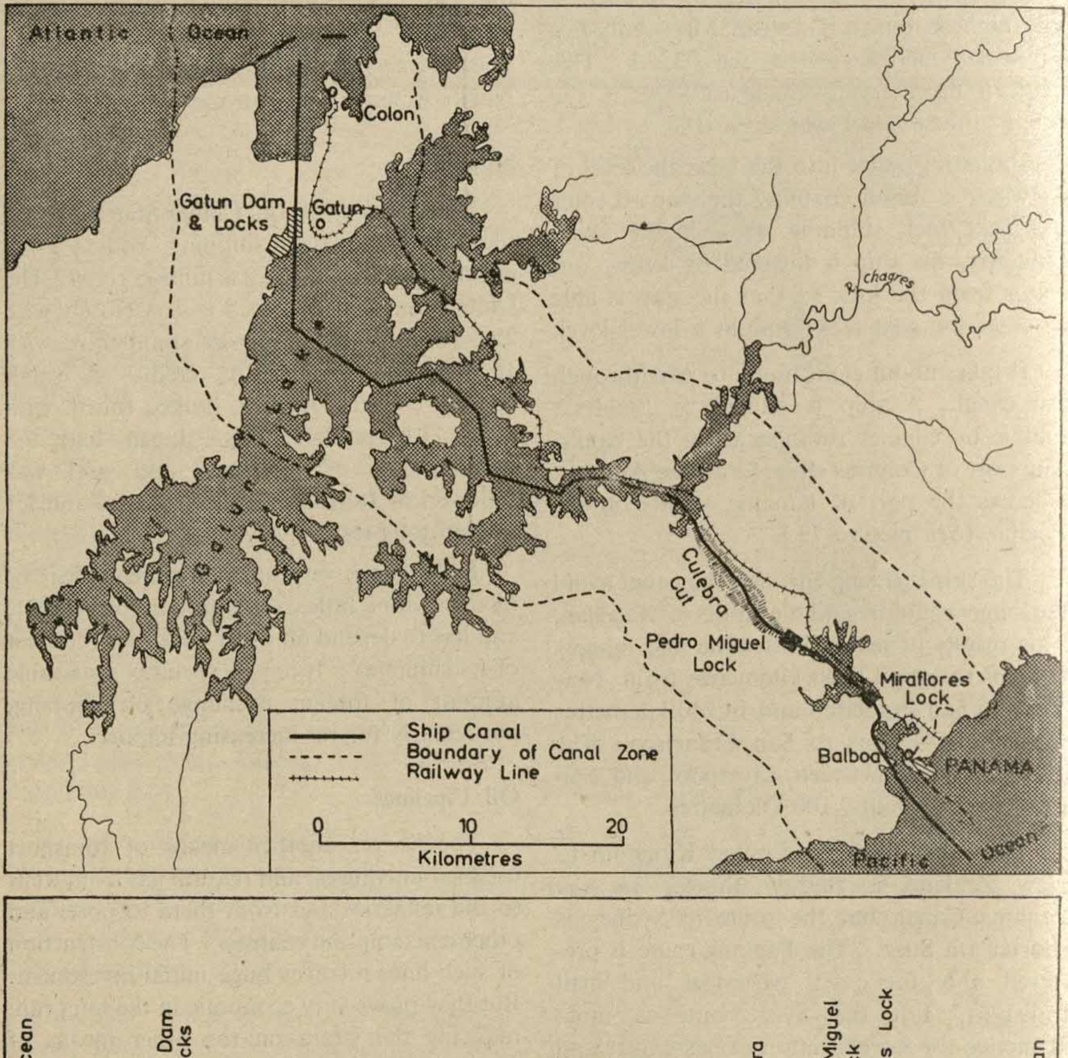
India has a very small merchant fleet of its own with a little over a million tons (1962); and has to depend on other countries for most of its shipping. It has to spend considerable amount of foreign exchange on shipping, particularly for its increasing imports.

Oil Pipelines

This is yet another means of transport used for moving oil and natural gas from wells to the refineries and from there to ports and other consumption centres. The construction of such lines involves huge initial investment. But they prove very economic in the long run, reducing the strain on the other means of transport like railways, barges, and tankers. The **United States** has about half a million kilometres of pipelines. Many of the Middle East Oilfields are also connected by pipelines to the ports on the Mediterranean. **India** has also laid pipelines from the Assam oilfields to move crude oil to the Barauni refineries, in Bihar and to Nunmati refineries near Gauhati in Assam.

AIR TRANSPORT

Just as the sea routes follow certain well-defined channels, the air routes, too, keep to



A Section across the Isthmus of Panama
(The height is exaggerated 1,000 times)

Fig. 69. The Panama Canal and Its Section (After E.J.S. Lay.)

The Suez Canal has a competitor in the Cape of Good Hope route. For the Panama, however, the Magellan route is a poor substitute. It is an American Canal not only in ownership but in function as well. Why is the canal thought to be a great engineering marvel?

certain routes, in spite of the limitless sky at their disposal. Adequate traffic and necessary facilities at airports are important considerations. Control of air-traffic, radio-aids to navigation, meteorological services, suitable runways, customs facilities, and maintenance and repair services are essential for the promotion of air-traffic. (*See* picture 70.)

With the advent of jet propulsion, flying time is now considerably reduced. It is amusing to note that a flight from Bombay to Delhi by a jet plane takes less than two hours, but the time taken to reach destinations at Bombay and Delhi and the waiting time to be spent at the airports, is much more than the flying time. This is particularly so on short distance flights.

The major cities of the world are connected by air routes on which air flights take place on schedule. Most of this operation is managed by private companies with the aid of the governments concerned. Some of the big operators are the PANAM, and TWA (both American), the B.O.A.C. (British), Air France (French), Lufthansa (West German), Swissair (Swiss), K.L.M. (Netherlands), Alitalia (Italian), Aerofloat (Soviet Union), P.I.A. (Pakistan) and Air India International. (*See* Appendix X.)

Air India International which is popularly known as Air India is a state concern sponsored by the Government of India. It is one of the popular and efficient air services in the world. In addition to this international line, India has the Indian Airlines Corporation to take care of its domestic needs. The four big cities—Bombay, Delhi, Calcutta, and Madras—are connected by jet and ordinary plane services. Most of the other cities are also served by regular flights.

In economically advanced countries like **the United States** the airways provide very valuable means of transport not only for people but also for all sorts of goods—including even perishables like flowers (tulips), eggs and milk. Because of their importance and location with reference to international air routes, some air-ports are exceedingly busy —New York, London, Paris, Frankfurt on

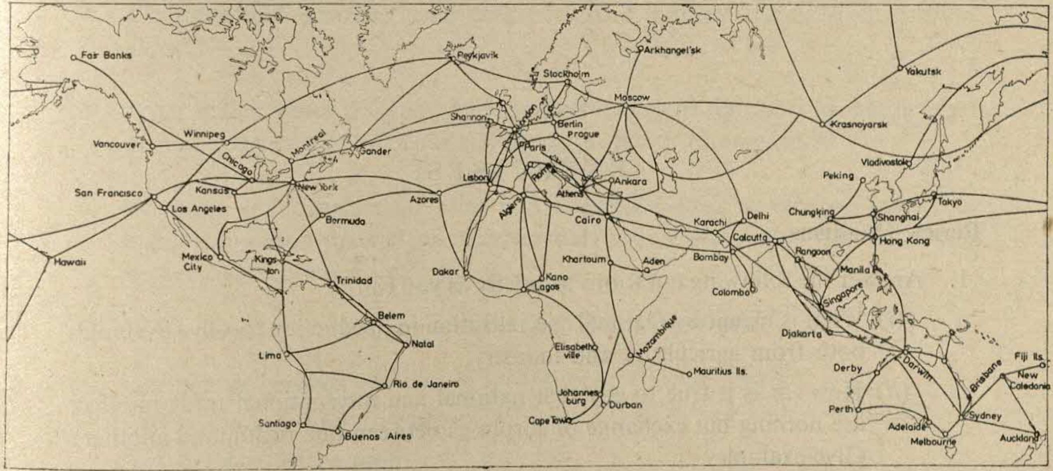


Fig. 70. World Airways (Adapted from L. Brooks and E.M. Coulthard.)

Travel by air is measured in hours and minutes. It is fast becoming popular, particularly for long journeys. Air routes follow great circles and also make detours, if necessary. How would you explain this? Compare this map with that of the sea routes. What points of similarities do you find between the two?

the Main, Geneva, Zurich, Rome, Cairo, and Tokyo (Fig. 70).

Other Means of Communication

In olden times, couriers or pigeons carried messages, news, orders, and advice from one person to the other, or from one place to another. Now we have a far more efficient means of doing this job.

The Postal System—The Penny Post was first introduced in Great Britain and was successful. The idea of charging the same postage (one penny) for any distance looked ridiculous at first, but practice proved its value. Now the postal system has spread all over the world and each country has its own postal department. India was one of the first countries to introduce air-mail as early as the year 1912. The International Postal System operates through the co-operation of the countries of the world.

The telegraph and the telephone are adjuncts to the Postal System and we see a vast network of telegraph and telephone lines in every country. Cables have been laid in the deep sea for inter-continental communication and one can get a cablegram like a telegram. The wireless, or radio communication, has revolutionized inter-continental communication.

These speedy means of communication are most helpful to commerce. Business transactions and deals can now be effected across the world in the twinkle of an eye. Scientists are now looking forward to the use of artificial satellites for efficient communication, including television, bringing the continents still closer to one another.

The "Early Bird" is a significant step in this direction with far-reaching social and economic consequences. Indeed, we are now living in a world that is shrinking very fast, day by day.

EXERCISES

Review Questions

1. Answer the following questions as briefly as you can :
   - (*i*) What is meant by regional specialization in production? Give examples both from agriculture and industry.
   - (*ii*) How far is it true to say that national and international trade in effect are nothing but exchange of surpluses between one region and another? Give examples.
   - (*iii*) Why is an efficient system of transport absolutely necessary for the promotion of industry and trade?
   - (*iv*) Give specific examples to show that villages and towns of today cannot do without each other.

(*v*) To what extent do you agree with the statement that an area self-sufficient in all respects is a dream of the past?

(*vi*) What different animals are still indispensable as means of transport in certain parts of the world?

(*vii*) Why is the invention of the wheel said to have brought about a revolution in transport?

(*viii*) What common units are used to measure the services rendered by railways?

(*ix*) Where do Indian railways stand in the world in their extent and performance? Give comparative figures.

(*x*) Is it true that India has paid little attention to develop inland navigation? If so, state why.

(*xi*) How adequate is Indian merchant shipping to serve our own requirements? Give figures in support of your contention.

(*xii*) Why are railways called the most important lifelines of a nation?

2. Write short notes on :

(*i*) Trans-Siberian Railway; (*ii*) Canal locks; (*iii*) The Cape Cairo Railway; (*iv*) Spaceships; (*v*) Early Bird; and (*vi*) Canalization of a river.

3. Trace in brief the story of transport and indicate how an extensive and efficient transport system is a "must" for rapid growth of industries.

4. Compare and contrast road transport with railway transport in various aspects.

5. What makes water transport the cheapest means of transport at the disposal of man, particularly for hauling heavy and bulky commodities?

6. Compare and contrast the Suez and Panama Canals as the two small but highly important arteries of international trade. Bring out the difference between their physical settings.

7. Write an essay on the subject of "Our Shrinking World".

8. Distinguish between the two by giving precise definitions :

(*i*) A sail-ship and a steamer;

(*ii*) A liner and a tramp;

(*iii*) A helicopter and an aeroplane;

(*iv*) A port and a harbour;

(*v*) A highway and a freeway;

(*vi*) A broad guage and a metre guage;

(*vii*) Air-mail and surface mail;

(*viii*) Telegraph and telephone; and

(*ix*) A telegram and a cablegram.

9. Classify the following means of transport into three major categories of transport by land, by water and by air and then arrange them in chronological order :

   (*i*) Steamers; (*ii*) Spaceships; (*iii*) Man himself; (*iv*) Logs; (*v*) Animals; (*vi*) Jet-air planes; (*vii*) Balloons; (*viii*) Aeroplanes; (*ix*) Motor cars and trucks; (*x*) Rafts and dug-outs; (*xi*) Horseless carriage; (*xii*) Sail-ships; (*xiii*) Wheeled carts; (*xiv*) Iron carriages drawn by horses; (*xv*) A railway train; (*xvi*) A sail-cum-steam ship; and (*xvii*) Luxury ocean-liner.

   Now re-arrange these according to their speed. What correlation do you notice between the two lists thus prepared ?

10. Complete the following statement by choosing the most appropriate ending :

    (*A*) North-east United States has a very dense road and railway network because :

    (*i*) the region is rich in road metal and the terrain is highly conducive to road and railway construction.

    (*ii*) the region is highly industrialized requiring very efficient and quick means of transport of every kind.

    (*iii*) the region is of strategic importance requiring quick movements of defence forces along the border posts.

    (*iv*) the region is poorly served by inland and coastal waterways.

Finding Out

(*i*) Find out the role being played by Indian railways in the rapid industrialization of the country.

(*ii*) Study carefully the various conventional signs used in maps to depict various features connected with road, railway, and water transport.

(*iii*) Collect figures to find out the progress made by Air India International.

Cartographic Work

(*i*) Prepare a suitable key of conventional signs used in maps in connection with land and water transport.

(*ii*) Draw a railway map of India showing the important routes, junctions, zones and places producing railway engines, coaches and wagons.

(*iii*) Prepare a road map of India showing important hubs of transport.

(*iv*) Draw a graph to depict the relative speed of important means of transport. Give a suitable caption to it.

Picture Reading

(*i*) Study carefully the picture of a freeway and explain in what way it deserves its nomenclature.

(*ii*) Compare and contrast the terrain in which the Suez and the Panama canals have been constructed.

Films Available

i. Caravans of Trade: The story of Transportation. No. 380; 22 mins; English; D.A.V.E.

ii. Development of Transportation. No. 385; 11 mins; English; D.A.V.E.

iii. Building a Highway. No. 388; 11 mins; English; D.A.V.E.

iv. Himalayan Life Line. No. 625.7; 11 mins; Hindi; D.A.V.E.

v. Century of Progress. No. 385.1; 12 mins; Hindi/English; D.A.V.E.

vi. Wheels for the Plan. No. 385.1; 11 mins; Hindi; D.A.V.E.

vii. Transatlantic. 10 mins; English; U.S.I.S.

viii. Suez Canal. No. 916.215; 9 mins; English; D.A.V.E.

ix. Panama: Crossroads of the Western World. No. 918.62; 10 mins; English; D.A.V.E.

x. Royal River. 19 mins; English; C.H.C.

xi. Wings Over India. No. 387.7; 17 mins; Hindi/English; D.A.V.E.

xii. Winged Mail. No. 387.7; 11 mins; Hindi; D.A.V.E.

xiii. Air Crossroads—London. No. 1907; 19 mins; English; B.I.S.

xiv. Hundred Years of Service. No. 384.1; 12 mins; Hindi; D.A.V.E.

xv. Men With Wings. No. 384.5; 10 mins; Hindi; D.A.V.E.

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CHAPTER 10

International Trade

TRADE has its origin in the old barter system which is current even today in certain parts of the world, for example, in some isolated Indian villages or tribal settlements in Africa and Central America. If a farmer produces more wheat than what he can consume, but he has no fodder for his cattle, he finds another farmer who needs wheat, and at the same time, can spare fodder in exchange. This exchange of excess or surplus produce between the two to the mutual advantage of both is known as *barter*.

From Simple Barter to International Trade

As the wants and surplus production of all persons do not always agree so perfectly, barter becomes difficult, particularly because of the increasing variety of products. So *tokens* came to be used as common standards of exchange. Surpluses then could be *sold* in exchange for such tokens by which deficits could be *bought*. These tokens in course of time took the form of *coins* in precious metals and came to be called *money*. Such money could be stored for future needs and thereby, wealth could be accumulated. Introduction of money, thus gave an impetus to trade and commerce.

A class of traders and merchants naturally developed who would buy the surplus production from some people and sell them to others for a higher price leaving a margin of profit for themselves. Some who had not ready money enough to buy would go to a money-lender who would advance them the necessary sum on certain conditions which included an *interest*, that is his profit.

People who had money to spare but could not find people who needed it, deposited their money with a *banker* who paid them interest on their deposit and whose business it was to advance money to others.

Instead of doing all these transactions on an individual basis people have found it more convenient to do them in a group by forming *companies*, *corporations* and *co-operatives*. Companies and co-operatives can be formed not only for the purpose of trade but also for producing things on the farm, or in a factory.

What is true of an individual, or a village is also true of a larger area, like a country. Certain areas, very often, specialize in the production of certain goods for a variety of reasons.

No area on the earth can profitably produce all the commodities required by man. So, with respect to certain commodities, some parts are surplus areas while others are deficit. India, for example, is surplus in tea but deficit in foodgrains, and Australia needs tea but has surplus foodgrains. Thus the two countries can exchange their surpluses, and make up their deficits. This gives rise to *international trade.*

Physical environments vary from place to place on the earth's surface. Some areas are far too mountainous, some are too cold, some are too hot, some are too dry, and some are too wet to suit any useful occupation. Some have good soils, in others the fertility may be poor. As a result of these differences, some areas specialize in the production of one or more of the commodities required by man.

Minerals and power resources are important apart from factors such as relief, climate, and soils. They are not distributed evenly over the earth's surface. Iron-ore, coal and petroleum are the most important minerals of our times. Industrial development is encouraged where one or more of these valuable minerals occur.

Certain non-geographic factors like capital, labour, and technical 'know-how' are also important. Some economically and technologically advanced countries like the United States, West Germany, Britain, France, the Soviet Union, Japan and Israel have more of these than most other countries.

All these differences, both geographic and non-geographic, have been responsible for the uneven distribution of agricultural and industrial production over the earth's surface. Consequently, the need for international trade has become greater and greater in recent years. Every country that participates in international trade exports some of its surpluses and imports its requirements from other surplus areas.

International trade is generally less important for a country which is favoured with a wide variety of natural resources. Conversely, it is very important in countries having a small variety of resources.

For example, a country like the United States, the Soviet Union or China which is endowed with a wide variety of natural resources, can become more or less self-sufficient and need depend very little on foreign imports. On the other hand, small countries like Denmark, Switzerland, the United Kingdom and Norway have to depend on international trade for their imports as well as exports for want of a wide variety of their own resources.

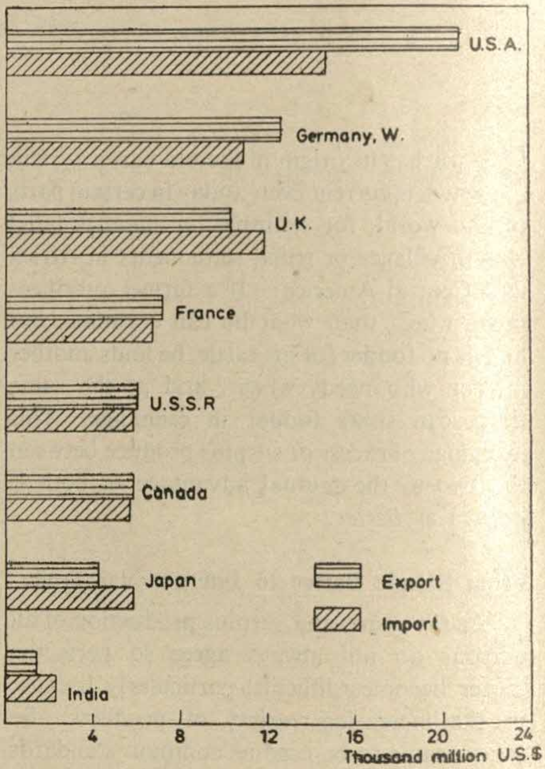

Fig 71. International Trade of Some Leading Countries (1961)

Note that the big exporters are also big importers. International trade is essentially a two-way traffic. What inferences would you draw from the volume of trade of the United States, the Soviet Union, the United Kingdom, West Germany, Canada, Japan, and India? Re-arrange these countries in the order of their *per capita* trade.

Today even small countries like Italy, the Netherlands, Belgium, Sweden, and Switzerland have a larger volume of international trade than India. How would you explain this?

The volume of the international trade of a country depends not on its natural resources alone, but also on its economic development, technological progress and the standard of living of its people. These factors are responsible for the constant change in volume, nature, and direction of international trade (Fig. 71).

A country that is on the verge of an industrial revolution may have to depend upon large imports of machinery and manufactured goods. Such a country in course of time may succeed in lowering its imports of these articles and may increase exports of finished products. This, in turn, may necessitate the import of new items such as industrial raw materials to feed its industries, to meet the growing demands of its people and also to step up exports.

During a period of 25 years between 1937 and 1961, international trade has increased five-and-a-half times. In 1961, its value rose to 273,000 million dollars from 50,000 million dollars in 1937.

International Trade of India

In 1961, India exported goods to the tune of Rs. 6,600 million, that is 660 crores of rupees. The principal importers of Indian goods are the United Kingdom and the United States together accounting for nearly 40 per cent of our total exports. The other important importers are Japan, the Soviet Union, West Germany, Canada, Ceylon, Australia, the United Arab Republic, and the Sudan (Fig. 72).

Our imports in 1961 were of the order of 10,147 million (or Rs. 1,015 crores) rupees. More than half of our imports come from only three countries—the United States, the United Kingdom and West Germany. The other important countries from which we import many of our requirements are Japan, Iran, the Soviet Union, Italy, Saudi Arabia, Australia, Canada, France, Czechoslovakia, Sweden, and Malaysia. What important commodities are imported from each of these countries?

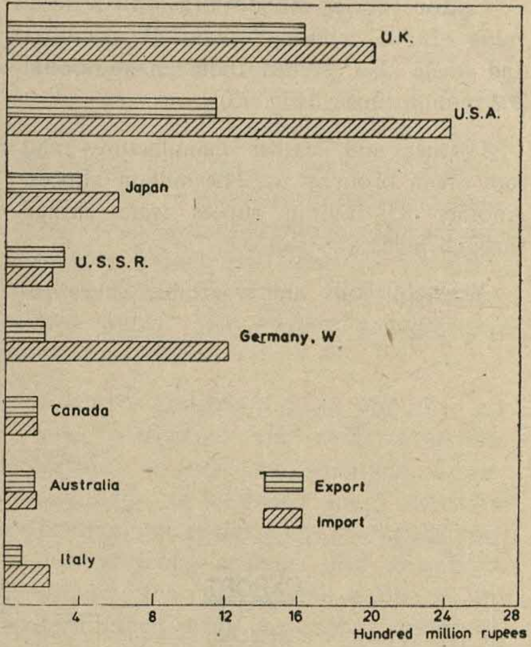

Fig. 72. India's Trade with Principal Countries (1961)

Note the nature of our unfavourable balance of trade with all our principal trading partners. Name the country with which we have the most unfavourable balance of payment. What makes our Government impose heavy duties on imports, specially from America and Canada?

Major Exports

Jute manufactures lead our exports, earning the maximum amount of foreign exchange. In 1961-62 the value of jute manufactures exported to other countries was worth 1,437 million rupees.

This was followed by tea which brought us foreign exchange worth 1,244 million rupees.

Cotton fabrics stood third with a total value of 505 million rupees. Raw cotton and waste also fetched India an additional 203 million rupees (Fig. 73).

Leather and leather manufactures and foot wear brought us 249 million rupees. Another 83 million rupees were earned through hides and skins.

Vegetable oils and vegetable cakes together gave us foreign exchange to the tune of 266 million rupees.

Cashew worth rupees 182 million rupees was exported in the same year. Spices added to our earnings by another 176 million rupees.

Sugar exports amounted to 153 million rupees and were closely followed by tobacco with 149 million rupees.

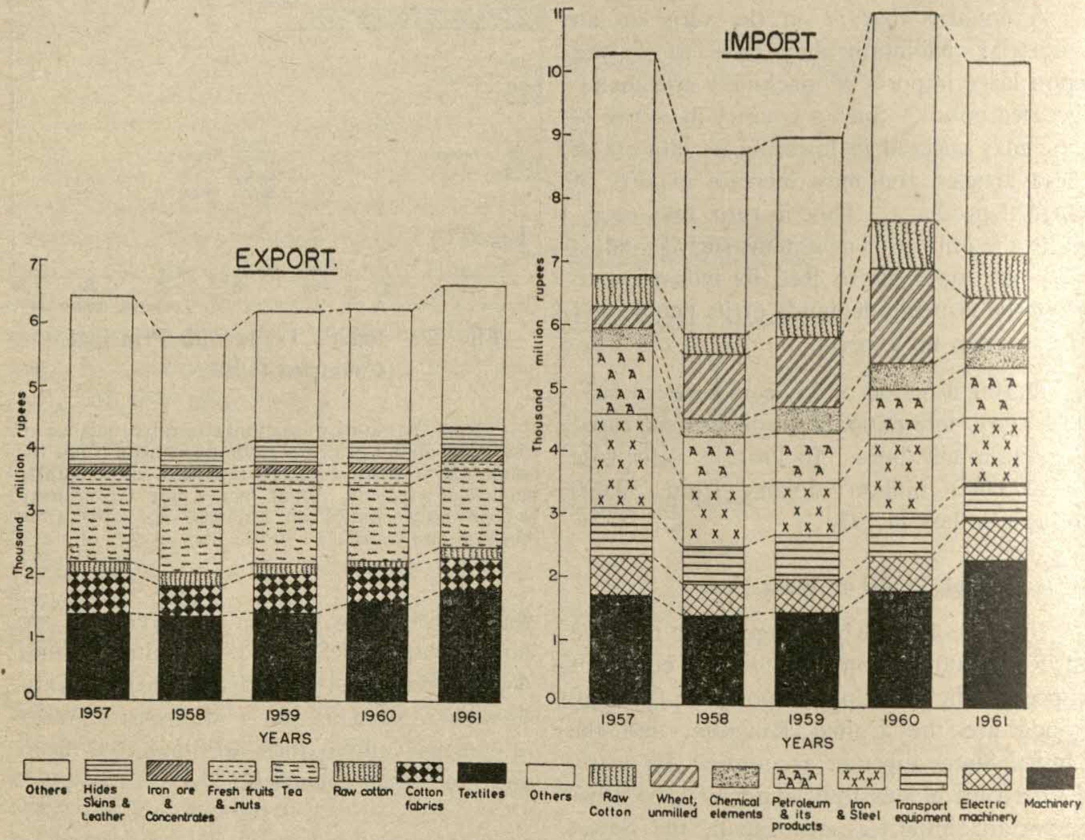

Fig. 73. India's Trade in Commodities (1957-1961)

Study carefully the trends in our export and import trade. Which items of export are becoming more important in our international trade? What items of import are gradually decreasing? What inference would you draw from the diminishing imports of these items?

Major Imports

The most important item of our imports is machinery. In the year 1961-62 it accounted for 2,370 million rupees. Electrical goods worth another 659 million rupees were also imported. Another item closely related to this category of goods is transport equipment including vehicles and locomotives which accounted for yet another 646 million rupees.

Iron and steel imports were of the order of 1,078 million rupees. Metals other than iron and steel accounted for 304 million rupees. The imports of iron and steel have begun to decline gradually as a result of our own production.

Closely related to our industrialization are mineral oils and chemicals. Mineral oils worth 959 million rupees were imported. These imports are also gradually decreasing with the steadily growing output of our new oilfields. Chemicals valued at 898 million rupees were also imported.

The imports of raw cotton and cotton waste were of the order of 608 million rupees. This again indicates that these imports were essentially to feed our cotton textile mills which have to depend on imported long staple cotton for the production of fine varieties, of fabrics some of which are exported.

Another important category of imports relates to food, drinks and tobacco, which together accounted for 1,487 million rupees. This is, indeed, a great strain on our national economy, for a country like ours which has a very broad base of agriculture engaging nearly four-fifths of our labour force. Food imports fluctuate from year to year, depending upon the harvest of our crops.

Gateways of International Trade

Ports are the gateways through which most of the international commerce flows.

Ports do not thrive simply because they are situated on the sea coast. Several geographic and economic factors are responsible for the rapid growth of ports, like New York, Bombay, and Calcutta.

The port must essentially have a good harbour—natural or artificial. An ideal harbour possesses a safe entrance of ample depth. It must have sufficient room for anchorage well-protected from the rough and stormy open sea. It adds to the utility of the port if it possesses an extensive water front. A port endowed with an ideal harbour must have enough level space for providing terminal facilities, such as ware-houses, railway yards, and modern loading and unloading facilities.

A port is destined to grow only if it has a large productive, and easily accessible hinterland. In some cases geographical conditions help to converge many lines of traffic upon one coastal point giving the port an advantageous position and an added importance, for example, the passes in the Western Ghats help the railway trafflc to converge on Bombay.

Besides these geographical factors,many economic, political and historical factors, are also responsible for the growth and development of big ports. San Francisco, New York, London, Amsterdam, Hamburg, Bombay, Yokohama, and Sydney are among the world's big ports. (*See* picture 71.)

India is not very lucky, so far as the coastline is concerned; she possesses very little indented coast and has very few natural harbours. Some of the old and prosperous ports of India like Surat, Broach, Masulipatnam, Kakinada, and Cauveripatnam, which are situated on the river mouths, have been silted. The major ports of today, in India, are of a relatively recent origin. They are Bombay, Calcutta, Madras, Cochin, Vishakhapatnam, and Kandla. Marmagao is another important port of India and is relatively old.

Bombay occupies almost a central position on the west coast of India. It is the only natural deep-water harbour of India. It is one of the most spacious and safe ports of the world and possesses natural facilities for shipping.

Almost one-half of the foreign trade of India passes through this port. Its imports exceed exports. It is the most convenient port for importing machinery and other manufactured goods from Europe. Its importance has been increased owing to the construction of the Suez Canal.

This port-city grew as it established better access to its rich hinterland—the black cotton soil region—across the Western Ghats. Today, Bombay City is one of the most important industrial and commercial centres of India. Its success is very much related to its being a well-developed port of an international standing. Textiles, oils, and oil-seeds are among its major exports.

Calcutta is the largest terminal port in South Asia. Situated on the mouth of the Hooghly, a distributary of the Ganga, it commands one of the richest hinterlands of the world, namely the Ganga-Brahmaputra basins.

The major exports of India, namely jute and tea, pass through this port. The other exports are coal, iron and steel goods, and mica.

Calcutta port is getting silted gradually and has, therefore, to be dredged constantly to keep it open. Being about 140 kilometres inland, the shipping of the port has to depend upon tides. A new subsidiary port of Haldia is being developed further downstream.

Madras is the third largest port of India. It is one of the big artificial ports formed by two concrete walls projecting into the sea. Its hinterland includes the tobacco-growing region of Guntur linked to it by the Buckingham Canal. Its exports include oil-seeds, hides and skins, tobacco, edible oils, and textiles.

Cochin is a fine natural harbour in Kerala. It possesses extensive sheltered backwaters and is safe even in the worst monsoon weather. It lies on the direct route to Australia and the Far East from Europe. Its hinterland is rich in spices, rubber, tea, and coffee. It is the most important naval centre of India. The exports include coir goods, cashewnuts, hydrogenated oil, and oil products.

Vishakhapatnam—This is a new major port of India. It is a great ore exporting port, catering to the mining region of Andhra Pradesh, Madhya Pradesh, and Orissa. It exports iron-ore, manganese ore, coal, tobacco and oil-seeds. It is also now a ship-building centre.

Kandla—This is another new major port of India and was developed recently almost from scratch. After the Partition of India and the loss of Karachi, the north-west regions—Punjab, Rajasthan and Delhi felt the need for a new outlet for their trade. The port is situated at the head of the Gulf of Kutch. It now serves Gujarat also. New railway lines now connect it with its hinterland.

Marmagao—This is yet another of the fine ports of Asia. It was under the possession of the Portuguese for more than three hundred years. It was freed from their rule in the year 1961 and hence its development had been arrested. It exports mainly iron-ore. Its hinterland covers parts of Maharashtra and Mysore States. It now has a bright future.

EXERCISES

Review Questions

1. Answer the following questions as precisely as you can :
    - (*i*) What is barter system?
    - (*ii*) How did introduction of money facilitate trade?
    - (*iii*) What makes international trade necessary?
    - (*iv*) How does a difference between the stages of technological development of peoples promote international trade? Give examples.
    - (*v*) Why are ports called the gateways of international trade and commerce?
    - (*vi*) What makes Bombay the finest port of India?
    - (*vii*) In what ways are the extent of a country, its population and standard of living related to its volume of trade? Cite examples.
    - (*viii*) Why does the total volume, nature and direction of trade of a country like India keep on changing? Name a few more countries passing through a similar stage.

2. Write short notes on :
    (*i*) Balance of trade; (*ii*) Imports and exports; (*iii*) Hinterland; and (*iv*) Natural harbour.

3. Trace briefly the early development of the barter system and explain why trade is called "a symptom of civilization"?

4. State the various factors that promote international trade. Which factors in your opinion are more important—the geographical or the others? Support your contention with examples.

5. Describe the international trade of India with special reference to major items of imports and exports. Who are our major trading-partners?

6. What are the essential factors that go to make a big port? Illustrate your answer with examples from different continents.

7. Compare and contrast the ports of Bombay and Calcutta from as many different points of view as you can, including their trade and hinterland.

8. Read the following sentences carefully and say which of the sentences are *true* and which are *false :*
    - (*i*) A country with a small size and population is bound to have very little international trade.
    - (*ii*) Very large imports of a country indicate its poor economy and industrial backwardness.

(*iii*) International trade eventually would vanish as every free country is bound to be self-sufficient in course of time.

(*iv*) For a country with large latitudinal extent and a variety of ample agricultural and mineral resources, international trade is relatively less important.

(*v*) The volume of trade of a country may change from time to time, but neither would the items of export and import change, nor the destination of its exports.

(*vi*) The textile industry in Great Britain would flourish again, only if it can become self-sufficient in its raw materials.

(*vii*) Our monopoly in exports of jute-textile goods can hardly be challenged by any other country because of the extremely favourable conditions that help India to grow more and more of jute every year.

(*viii*) But for the Industrial Revolution that took place in the United Kingdom, the large volume of world trade today would be almost unthinkable.

Re-write the wrong statements giving reasons for each.

9. Complete the following statements by choosing the correct or the most appropriate ending :

(*A*) Switzerland can meet its requirements of tea by

(*i*) a careful and scientific development of its own tea gardens.
(*ii*) purchasing tea plantations in an underdeveloped country.
(*iii*) importing tea from abroad in exchange for its manufactured goods.
(*iv*) by giving aid to a tea producing underdeveloped country.
(*v*) by air lifting fresh leaves and curing them at home.

(*B*) A high per capita international trade is possible for a country if

(*i*) it happens to be very big and populous.
(*ii*) it has a very small population.
(*iii*) its people enjoy a very high standard of living.
(*iv*) it just possesses a large variety of ample resources.

(*C*) The main asset of Kandla port lies

(*i*) in its being a deep sea port.
(*ii*) in its having a free trade zone unlike other Indian ports.
(*iii*) in its being situated fairly inland.
(*iv*) in its being well-connected with its hinterland.

10. Study carefully the list of trading commodities and the names of countries as given in the table below; and then complete the table with appropriate entries in each column from the given list of trading commodities :

(*A*) Trading commodites——(*i*) Rice; (*ii*) Wheat; (*iii*) Oil-seeds and Vegetable Oils (*iv*) Cotton; (*v*) Raw-jute; (*vi*) Tea; (*vii*) Rubber; (*viii*) Hides and skins; (*ix*) Coal; (*x*) Iron-ore; (*xi*) Manganese-ore (*xii*) Mica; (*xiii*) Mineral oil; (*xiv*) Jute textiles; (*xv*) Cotton textiles; (*xvi*) Metal goods and (*xvii*) Machines and tools.

Name of a country	*Items in which the country is deficient*	*Items in which the country is self-sufficient*	*Items in which the country is surplus.*
Burma			
India			
Japan			
Malaysia			
Pakistan			
United Kingdom			
United States			

Now, draw your own conclusions after analysing the entries in all the three columns for each country as regards the best way to obtain what it badly needs, but cannot produce.

Finding Out

(*i*) Find out the broad facts about the international trade of India for the past year and compare them with those of the year 1961. Draw your conclusions regarding the latest trends.

(*ii*) India has a long coastline but very few major ports. Find out all that you can about the efforts being made to develop and modernize our major ports like Vishakhapatnam, Kandla, Bombay, Calcutta and its subsidiary port of Haldia.

Cartographic Work

Draw sketches of Bombay, Calcutta, Kandla, and Madras ports and the lines of communication connecting them with their hinterlands. Name the major imports and exports of these ports.

Picture Reading

(*i*) Look at the pictures of ships in the Panama and the Suez canals. What commodities do you expect these ships to carry from the Pacific to the

Atlantic and *vice versa?*

(*ii*) Look at the picture of San Francisco port. How would you account for the rapid development of this port-city? Why is it called the gateway of the United States?

Films Available

i. World Trade for Better Living. No. 382; 17 mins; English; D.A.V.E.
ii. The Big Change in World Market. 33 mins; English; U.S.I.S.
iii. Promotion of Export. No. 382.6; 22 mins; Hindi; D.A.V.E.
iv. Japan International Trade Fair Osaka. NO. 29; 25 mins; English; J.I.C.
v. Distribution of Foods. No. 633; 11 mins; English; D.A.V.E.
vi. Seven Islands. No. 915.4; 22 mins; Hindi; D.A.V.E.
vii. Departure of a Freighter from the Hamburg Port. No. 260; 14 mins; English; Embassy of the Federal Republic of Germany.
viii. Calling Sydney Harbour. No. 144; 18 mins; English; A.H.C.
ix. Cargo Handling at the Ports. No. 1447; 25 mins; English; B.I.S.
x. Port of London. No. 2060; 30 mins; English; B.I.S.
xi. Operation of Kandla. No. 387.12; 10 mins; Hindi; D.A.V.E.

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CHAPTER 11

Population— Its Distribution and Growth

MAN being central to the study of geography, his distribution on the earth's surface is of special significance to geographers. In fact, all other elements, whether physical or cultural, are essentially studied in relation to man.

Unlike almost all other elements of environment, man possesses an extraordinary quality of locomotion or mobility and is the most adaptable species that can survive almost anywhere on the earth. To geographers, the distribution of man over the earth has, therefore, special significance.

The most striking feature of the distribution of population is its unevenness. Some areas have a population of more than a thousand per square kilometre, whereas some large areas have none. Between these two extremes are found a large number of patterns of population distribution whose causes and consequences concern each one of us, directly or indirectly.

Yet another equally striking phenomenon is the rapid growth of population at an alarming rate in many parts of the world including India. The pace at which the world population has been growing since the beginning of the Industrial Revolution, and specially during the last thirty years or so, is again a matter of direct concern to each one of us.

The new trend of population concentrating heavily in a relatively few urban centres also poses new problems. Today, urbanization is no more confined to Europe or America alone. It has engulfed even the old agricultural and rural civilizations of the East. (*See* pictures 74 and 75.)

UNEVEN DISTRIBUTION OF POPULATION

Perhaps the most striking disparity between the population can be best illustrated by comparing the tiny island of Manhattan with the continent of Antarctica. Whereas the former with its total area of 56.3 square kilometres has a population of well over two million people, the latter with an area of 13.5 million square kilometres to its credit has no permanent population at all. This is a continent bigger than the combined area of Australia and Europe—excluding the Soviet Union. (*See* picture 75.)

Even within a small country like Japan, the population is distributed very unevenly.

Hokkaido, the northern Island of Japan, has less than 75 persons per square kilometre, whereas Kyushu, the southern island, has over 400 persons per square kilometre.

In India, the Gangetic Plain has more than 300 persons per square kilometre, as against less than 50 in Rajasthan.

Factors Affecting Population Distribution

Generally, no single factor can explain the uneven distribution of population. A large number of factors are at play and are collectively responsible for a given situation. Very often, these factors are interwoven and interconnected. The two most important sets of factors are cultural and physical.

Among the cultural factors may be mentioned historical, political and technological.

Australia, for example, is a sparsely populated continent both because of history and its national policies. In the first place, it is a continent that was discovered very recently. Even after its discovery it really attracted the attention of the British people only when they lost their American colonies. Today, because of its White Australian policy its doors are closed to all peoples except the whites for permanent settlement. This explains how history and political considerations affect distribution of population.

Prior to the colonization of Australia there were Australian aborigines. As they were living entirely by hunting and gathering and were in a very primitive stage of development, their number did not grow. Similarly, in America the Red Indians, even when they knew how to grow corn, could not make use of the vast natural resources of their land and were, therefore, unable to develop and sustain a high density of population.

The scientific and technological progress made during the last century and a half has enabled certain parts like Europe, North America, and Japan not only to increase their population very rapidly but also to raise the standard of living of their people. (*See* Appendix VIII.)

Social values and religious beliefs, attitude towards the size of the family, the need for maintaining the continuity of the family, particularly through a male successor, consideration of security in old age, fear of untimely death of children, and ensuring performance of funerary rites in honour of ancestors, are some of the very important cultural and religious factors which also contribute substantially to the uneven distribution of population.

The physical or natural factors affecting the distribution of population are, the nature of the terrain and its structure, the soil, temperature, rainfall, availability of water, easy accessibility to mineral resources, geographical location, and possible easy access to other parts of the world.

Most of the population is found in plains rather than in hilly or mountainous areas. The Indo-Gangetic Plains, and the plains of western and central Europe are the examples of danse population. On the other hand, the Siberian Plain is very sparsely populated partly because it is a peneplain very often devoid of any fertile soil, unlike the river valley plains made of fine, fertile, loamy soils.

In Indonesia the islands of Java and Sumatra fall in the same type of climate, namely the equatorial. Both the islands have a luxuriant growth of tropical forest vegetation. The island of Java is very densely populated, whereas Sumatra is inhabited very sparsely, except in a few sharply delimited areas. The high density of population in Java is attributed to very fertile soils derived from young basic volcanic material. On the other hand, the soils in most parts of Sumatra are derived from old acid and non-volcanic rocks. The latter soils are badly leached and as soon as the forest is cut these soils get depleted.

The bulk of the Canadian population is found in a narrow belt along its southern borders where it has a relatively warm climate. Very sparse population in the tundra regions in North America and Eurasia and the total absence of population in Antarctica are due to very low temperatures.

Large areas of the sparsely populated regions of the world can also be demarcated by the 50 and 200 centimetre isohyets. The areas enjoying less than 50 centimetres and more than 200 centimetres of rain, are generally thinly populated. The Thar desert of Rajasthan and the Equatorial regions of the Congo and Brazil offer good examples.

The Nile Valley is an example to indicate that even a region with very low rainfall can be thickly populated if it gets enough water through irrigation. West Pakistan is another example to show how canal irrigation leads to a rapid increase in population, in areas which were once semi-deserts.

The huge agglomerations of population in Europe and the growth of towns like Kalgoorlie and Coolgardie in the Great Australian desert indicate how the mineral deposits influence the distribution of population. Particularly interesting is the fact that water has been brought to Kalgoorlie from a distance of 490 kilometres, exclusively to meet the demands of the people exploiting the local mineral resources.

The famous gold-rush, of California, Alaska and Australia and the ghost towns in mining areas, further indicate how mineral resources influence the distribution of population. Towns which were once large centres of population and are now completely deserted are known as *ghost towns.*

Geographical location and a possible easy access to other parts of the world have led certain places like the Manhattan Island to grow out of all proportions in a short span of time. The old city of Delhi and new metropolitian centres like Bombay and Calcutta owe their origin and growth to their favourable location and easy accessibility to other parts.

The Densely Populated Parts of the World

Eastern Asia, which includes large parts of China, Japan, Korea, the Philippines, and North Vietnam, accounts for nearly 30 per cent of the world's population. China possesses two distinct belts of dense population, one along the coast stretching north-south for about 1,500 kilometres, and the other running east-west, along the Yangtze Valley (Fig. 74).

South Asia, which includes parts of India, East Pakistan, Ceylon, Burma, Thailand, South Vietnam and Indonesia, is another densely populated part of the world. About a quarter of the world population lives in this region. The deltas of the Ganga, Brahmaputra, the Irrawaddy, the Menam- and the Mekong and the islands of Java and Bali have a high density of population.

These two regions with a very high density of population are essentially agricultural regions with a growing season, almost all the year round. They enjoy warm climate, and have very fertile soils which make it possible to raise two, or even three crops from the same piece of land, year after year.

Western Europe is another region with a high density of population. This triangular region with a base extending from Spain to

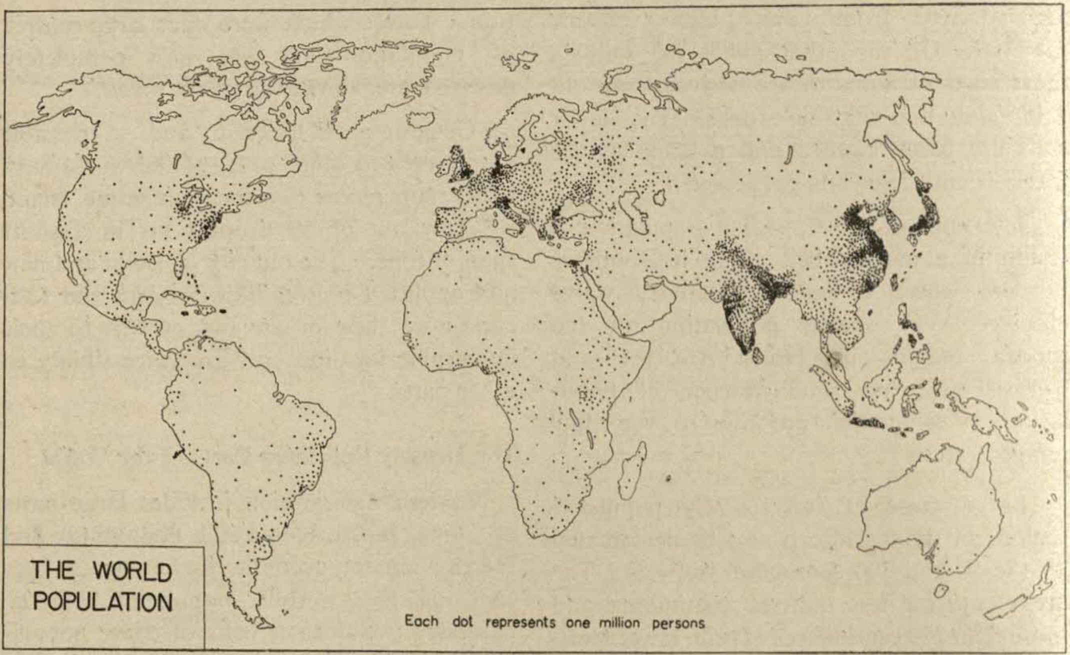

Fig. 74. World Distribution of Population

The map is based on the latest data available for various countries as given in the United Nations Statistical Yearbook, 1963. Note carefully the major regions with a high density of population and the empty spaces. How would you account for the wide variation in the density of population in the regions enjoying the same type of climate?

Scotland tapers eastward into the Soviet Union. It includes Great Britain, France, Belgium, the Netherlands, Germany, North Italy, Poland, Ukraine, and Soviet Russia. Unlike the Asian agglomerations of population, the basis of the high density of population in this region is the abundance of mineral resources and successful industrial development.

Central East North America is yet another region with a high density of population, It is much smaller in total population and limited in extent as compared to the other three regions. It includes the St. Lawrence Basin, the region around the Great Lakes and the north-eastern part of the United States from the Mississippi to the Atlantic coast. This region as a whole enjoys perhaps the highest standard of living in the whole world. Industry is the keystone of its prosperity.

Sparsely Populated Regions

Low population densities are often a result of unfavourable climatic and other geographical conditions. Extremely low and extremely high temperatures and very heavy and very scanty rainfall are usually associated with a very low density of population, for example the hot and cold deserts and equatorial forest lands with heavy rainfall.

The remarkably inhospitable polar lands of Antarctica in the south and the tundra region in the north are among the least populated lands of the world. In the Northern Hemisphere they include Alaska, Northern Canada, Greenland, Iceland, North Scandinavia, Northern Siberia, and Kamchatka.

The high mountainous regions along the west coast of North and South America is a region of low population. Likewise, the mid-world mountain chain running east-west from Spain to the Malaya Peninsula is another broad belt with a very thin population.

The high intermontane plateaus particularly in temperate latitudes, are among the most inhospitable places of the world. Tibet and the dry plateau of Mongolia have very thin population. The Columbia Plateau in North America is another example. The high Bolivian plateau in South America, although sparsely populated is, however, not so inhospitable, because it is in the tropics.

The most conspicuous empty spaces are the deserts of Sahara and the Somalia in North Africa; the Arabian, the Persian, and the Thar deserts in South-West Asia; the Takla Makan and the Gobi in Central Asia; the Great Desert in West Australia; the Kalahari in South-West Africa; the Patagonia and the Atacama in South America; and the Mexican, the Californian, and the Colorado deserts in North America.

The thickly forested region of the Amazon and to a certain extent of the Congo are the other areas with sparse population.

Areas With Moderate Population

In between the two extremes of very densely populated areas and areas with sparse population are transitional areas with moderate densities. In most of the thickly populated regions, the density of population decreases gradually from the areas of maximum congestion towards the voids.

In some section there are a few small but conspicuous concentrations within the zones of very low densities of population. The Nile Valley in the United Arab Republic, some oases in the African and Asian deserts, and a few mining towns like Kalgoorlie and Coolgardie in the Great Australian desert are examples.

POPULATION GROWTH

Determining the exact population of the whole world at any instant of time is not an easy task. Every moment, hundreds of new babies are born while a large number of people die. Most of the countries periodically undertake an official numbering of their population and collect relevant statistics. This operation is known as *census*. In India, the census is taken every ten years, at the beginning of each decade. The last census taken in India was in 1961.

The methods of taking a census and collecting data are not uniform all over the world. Data collected by every country are not always accurate and hundred per cent reliable. The United Nations and its agencies encourage nations to adopt uniform methods and achieve greater accuracy in the collection and interpretation of data.

In the year 1960, the total world population was estimated to be 3,010 million people. If all the people were distributed evenly all over the world, there would be 22 persons per every square kilometre of land surface. The uniform distribution of the people on the earth's surface in practice is, however, no more than a myth. Nevertheless, it helps us to make meaningful comparisons among various parts of the world.

Growth of Population in the Past

The world population* of today had certainly a very humble beginning. To begin with, it grew very slowly. Man must have spent thousands and thousands of years, his efforts being merely to survive.

The earliest mode of making a living through gathering and hunting could support only a few people over large areas. This is what we see even today where man makes his living, mostly by fishing and hunting.

When man took to agriculture and domestication of animals, even the small patches of favourable lands could sustain large numbers of people. The ancient river valley civilizations of the Nile, the Tigris, and the Euphrates, the Hwang Ho, the Indus and the Ganga provide some of the examples. People, however, continued to throng in a few fertile lands blessed with comfortable climates. They were still living in small pockets as it were.

Large parts of the world continued to be either completely unoccupied or very sparsely inhabited.

Then came the Era of Discovery and Exploration. It was closely followed by the Industrial Revolution which brought the entire world on the threshold of the Industrial Age.

With rapid progress in science, technology, means of transport, and communication, man went almost to every nook and corner of the world. Large areas were explored and new lands were colonized.

Various gifts of nature, specially the agricultural, mineral, and power resources came to be harnessed more and more in the service of man. Instead of striving just for survival, he came to lead a richer, more meaningful, and comfortable life as his dependence on his own muscle power gradually gave way to the use of more and more complicated machines run by mechanical power.

The progress of man has never been so simple and smooth as that. There were always ups and downs. He had to face floods and famines. Periodic outbreak of dreadful epidemics and a host of other natural calamities came his way. Things were even worse when man himself indulged in war and self-destruction. Millions of lives were sacrificed in wars which rarely ever solved any of his problems.

Pondering over his own folly he is now increasingly using his energies and resources to make this world a better place to live in.

Man is now better equipped to protect himself against the harshness and the vagaries of climate. The frontiers of the inhabited world are steadily extending towards the poles. Special ships and trains carrying food grains rush to the famine sticken areas from almost all over the world. New varieties of seeds, the crops of which ripen in short duration, have been developed. Parts of arid and semi-arid deserts now bloom with two, or even three crops a year with the successful taming of giant rivers.

Man is fighting bravely against ignorance, disease and want with promising results. The death rate has been considerably reduced and the longevity or expectancy of life is steadily increasing even in the underdeveloped parts of the world.

No wonder then, if all this has resulted in a phenomenal growth of population as was never expected before. According to a study of world population published by the United Nations, the world took approximately 200,000 years to register a world population of 2,500 millions by the middle of this century. The study further points out that it would take just 30 years more to add another 2,000 millions.

According to another estimate the world population was about 728 millions in A.D. 1750. It rose to 906 millions by the year 1800. During this fifty-year period the population grew by 24.4 per cent. In the next fifty years the percentage of increase was 29.0 and the total world population went up to around 1,171 millions. By the end of last century it grew to 1608 millions registering a rise of 37.3 per cent over a period of fifty years. In the first half of the current century it added nearly another 800 millions with the percentage increase of 49.6.

In a period of 30 years between 1930 and 1960, the world population has grown by 995 millions, that is by 49.3 per cent.

Population and Its Growth by Continents

If Antarctica is a continent without any permanent population, the Asian continent (excluding the Soviet Union) alone accounts for as many as 1,684 millions, more than half the world's population.

Europe (excluding the Soviet Union) with its 426 millions stands next only to Asia in total population. As a continent, it however, leads all the continents including Asia in population density. In 1960, its overall density of population was 85 as against 60 per square kilometre in Asia.

North America stands third both in total population and density. With 267 million people, the density works out to be just 11 persons for every square kilometre.

The Soviet Union with 214 million people closely follows North America not in total population but in density. If all the persons in the Soviet Union were evenly distributed over its large area, there would be only 10 persons in every square kilometre of its land area.

Africa, which stands next to North America in total population (257 millions), has a still lower density of only 9 persons per square kilometre.

South America with 145 million people claims the same density as Africa.

Oceania, more than two-and-half times larger than India, has a total population of just sixteen and a half million, approximately the population of Kerala or half the population of Madras State. The density of population of Oceania, which includes Australia, New Zealand and other islands in Central and South Pacific, is as low as 2 persons per square kilometre.

The world population in the year 1930 was 2,015 millions. By 1960, in a period of 30 years, the population rose to 3,010 millions registering an absolute increase of 995 millions, that is 49.3 per cent. The absolute growth of population in Asia alone was 612 million; in Africa 100 million; in North America 98 milllion; Europe and South America 70 millions each; the Soviet Union 38 millions; and Oceania 6.1 million (Fig. 75).

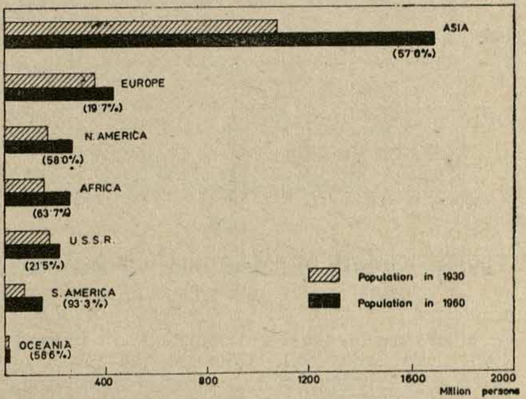

Fig. 75. Distribution and Growth of Population by Continents (1930-1960)

Study carefully the increase in population in different units shown in this diagram. Find out the percentage of increase in each of them over a period of 30 years between 1930 and 1960. Re-arrange these units in order of percentage increase.

In percentage increase, it is the southern continents which lead. South America shows a percentage increase as high as 93.3 The lowest percentage increase is found in Europe, which is 19.7. How would you account for the different rates of growth in the different continents?

Population Growth in India

In the year 1961, the total population in India was over 439 millions, which if evenly distributed all over the country would give a density of 134 persons per square kilometre. In 1901, the population of India was 236 millions, with a density of 72 persons per square kilometre. Thus the absolute popslation increase is about 203 millions, a rise by 86 per cent (Fig. 76).

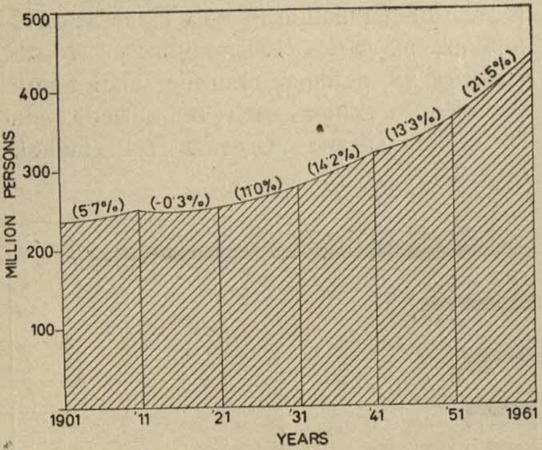

Fig. 76. **Growth of Population in India since 1901**

Study carefully the total population of India in 1921, 1941, and 1961. Compare the percentage of increase during these periods. How would you account for the increasing rate of growth in population in our country?

With such a phenomenal growth in population the standard of living in the country as a whole is bound to fall unless national production and income also keep pace with it. It is obvious that the growth of population implies growing pressure on cultivable land, the area of which remains more or less constant. The same piece of land can, however, feed a growing number of mouths, only if its yield or productivity is increased by concerted efforts, making use of scientific knowledge, and modern techniques that have generally proved successful.

Growth of population also demands more and more employment opportunities to millions and millions of young people, who connot be sustained by agriculture. This usually leads to the migration of population from villages to towns and cities. Rapid industrialization thus becomes inevitable to increase national output, providing in its wake more and more jobs to the needy. This is why urbanization has engulfed the lands of both the New and the Old World. (*See* Appendix VII).

URBANIZATION

If settled agriculture led to the development of such small but compact settlements as the innumerable villages in our country, industrialization has brought in its wake the huge urban centres, namely the modern cities and metropolitan centres (Fig. 77.)

The people in villages or rural settlements are essentially engaged in making a living directly from the land. There is not much of a difference between one village and another. Its pattern is also relatively simple.

For a long time, villages such as ours aimed at self-sufficiency since barter was the order of the day.

With the general growth of crafts, trade, and commerce, however, certain villages grew in size because they were favourably situated to conduct trade with other villages in the neighbourhood. Village fairs, weekly markets, and places of worship made certain villages much bigger than others. The seats of chieftains and governments and places of learning very often grew in size. Occasionally their growth in one kind of activity gave impetus to another. This is how many of the old cities had their humble beginning. The then cities invariably grew in the midst of an agriculturally rich land, which may

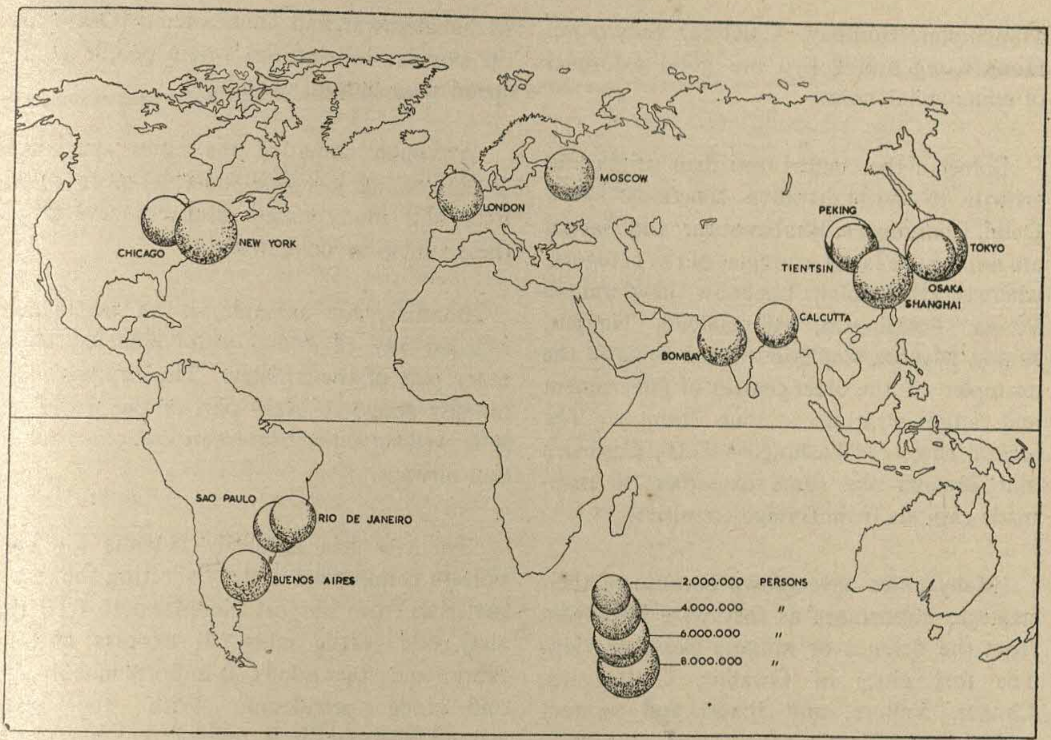

Fig. 77. The Leading Metropolitan Cities of the World

The diagram shows the leading fourteen cities proper, having a population of at least three millions each. Note that half of these large urban centres are in Asia, especially in China, Japan, and India. South America, again a continent mostly living on its agricultural resources, follows Asia. What factors are responsible for the growth of each of these centres? How many of them are situated inland?

not be necessarily so today. (*See* Appendix XI.)

Among the most ancient cities of the world stand the old Indian cities of Mohenjodaro in the Indus Valley, and Varanasi, Delhi and Pataliputra in the Gangetic Plains.

Functions of Towns and Cities

Modern cities usually perform specific functions. Many of them are manufacturing centres. Jamshedpur, Bhilai, Rourkela, Perambur, and Chittaranjan, are some of the latest manufacturing towns that have sprung up on the map of India. Cities like Kanpur, Bangalore, Bombay, and Calcutta are among the slightly older centres that have grown chiefly because of their manufacturing activities.

Certain cities specialize in trade and commerce and discharge mainly commercial functions. They collect raw materials or import goods from foreign countries, store them in godowns and distribute them among the customers. They provide capital, offer various banking and other transactional facilities, and determine the market rates of various commodities, articles, and stocks and shares everyday. New York, London, Manchester, Bombay, Calcutta, Singapore, Hong Kong and Tokyo are good examples of commercial cities.

Some of the centres owe their origin and growth to administrative functions. New Delhi, Chandigarh, Bhubaneswar and Bhopal are among the latest examples of the category, whereas Old Delhi, Lucknow, Hyderabad, Poona, Pataliputra, Ahmedabad, Nagpur, Jaipur, Mysore, and Madras are some of the examples of the older centres of government and administration in our country. The federal cities of Washington D.C., Canberra and Brasilia are some examples of man-made capitals from foreign countries.

Many cities have grown because of their strategic importance as they were important from the defence or military point of view. The fort cities of Gwalior, Chittorgarh, Chunar, Vellore, and Jhansi and military centres in the frontier regions such as Attock, Peshawar, Rawalpindi, Pathankot, Ambala, and Gangtok are some of the examples from the Indian sub-continent. Gibralter, Lhasa and Ottawa are some examples of foreign cities of this kind.

Another category of towns and cities owes its origin and development to religious, educational, and certain other cultural activities. Typical examples are Varanasi, Nalanda, Rameshwaram, Madurai, Dwarka, Hardwar, Allahabad, Aligarh, Sagar, Roorkee and Pilani, all from India. Oxford, Cambridge, Mecca, Bethlehem, Jerusalem, Rome, and Florence are some examples from other countries.

A few towns in India owe their origin entirely to a new function, namely recreation. Towns like Gulmarg, Pahlgam, Simla, Mussoorie, Naini Tal, Almora, Darjeeling, Shillong, Mount Abu, Pachmarhi, Matheran, Mahabaleshwar and Ootacamand (Ooty) are the popular hill-stations where people go to spend their summer holidays.

Although some of the cities specialize in performing just one function, more often than not, many cities discharge several of these functions concurrently.

Bombay, for example, is an important railroad city of India, well-connected with every part of the country. The city has also an easy access to every part of the world as it is well-served by international sea routes and airways.

The city has naturally become an important commercial centre collecting the raw materials from its vast hinterland to feed its sixty odd textile mills. It exports cotton fabrics and other goods. It imports machinery and crude petroleum. With the best natural harbour, it is one of the two most important gateways of the country's international trade and commerce. It has become the Commercial Capital of India.

With its three scores of textile mills, two very big oil refineries, a big fertilizer factory and several other chemical industries, it is also one of the leading manufacturing cities of India.

Further more, it is the seat of the State Government and has an important naval establishment.

Besides all these, being an important university centre it claims several important research institutes working in the field of sciences and humanities. The country's atomic research centre is also located in this city at Trombay. It is also a fashion centre and the nerve centre of the film industry in India. It is one of the large cities in the world, like London, Tokyo, New York, Shanghai, and Moscow.

Location and Site of Towns and Cities

If political, historical, social, and religious factors have a say in the development of towns and cities, the geographical factors play an equally important role in their growth. Urban centres grow rapidly, if they have a rich and prosperous hinterland.

Availability of large open space for expansion of towns, abundant water supply for domestic and other consumption, cheap and ample supply of power, easy access to agricultural produce, minerals, and other raw materials, and an adequate and efficient means of transport and communication are factors that promote the rapid growth of towns and cities.

Cities are also classified according to their situation and sites. Some are port-cities situated near spacious and safe harbours. A large water-front, space for warehouses and godowns, facilities for quick loading and unloading, and a network of railways and roads, make port-cities very often grow out of all proportion. New York and Bombay are good examples of port-cities.

A large number of present day towns are situated on rivers. Even among them, different locational factors are responsible for their growth.

A town, like Hardwar, grows up because it is situated at a point where a river descends from the hills and enters the plains, at the limit of navigability.

Towns, like Kanpur and Mirzapur, become important because of the ease in crossing a big river by a railway and road bridge or by a pontoon bridge, or a ferry service.

Towns, like Allahabad and Paris, gain in importance, as they are situated at the confluence of big rivers, the junction of two routes.

A town, like Varanasi, because of its religious sanctity becomes almost immortal; it is situated on the high bank of a river, safe from occasional floods.

A town, like Vijayawada, grows because it is located at the head of a big river delta, the easiest fordable point.

An inland port, like Calcutta, London, or Manchester, grows if large ships can reach it, at least during high tides.

A town, like Chicago, in the heart of a rich hinterland grows rapidly and becomes an important transport centre as it is situated at the head of a big lake, where there is a change in the mode of transport from water to land and *vice versa.*

A town, like Peshawar, situated at foothills and commanding a strategic pass becomes an important centre because of its military utility and a nodal position.

Location of Delhi

Delhi, the capital city of India, through the ages, occupies a key position commanding two very fertile and thickly populated basins of the Indus and the Ganga in the Indian sub-continent. Whereas the former lies to its north and north-west, the latter spreads to its east and south-east (Fig. 78).

Delhi occupies a central position in a

relatively narrow corridor bounded by the Himalayan ranges on the one hand, and the barren Thar Desert and Malwa Plateau on the other.

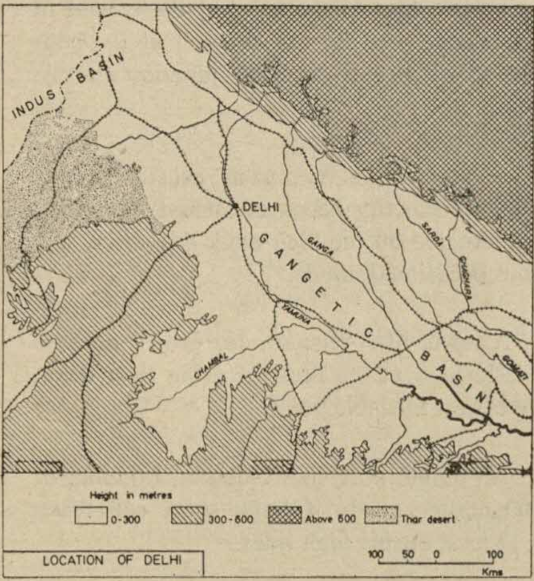

Fig. 78. Location of Delhi, the Capital City of India

What geographical factors are responsible for the continued importance of Delhi in the political life of the nation? How has the Partition of the Indian sub-continent affected the postion of Delhi as the capital of the Indian Union?

Situated on and along the Delhi Ridge, an off-shoot of the Aravallis, the city stands on the western bank of the Yamuna, occupying thus a strategic position.

Today, the Jumna Bridge near Delhi connects the city with the Gangetic Plain through railway lines and the Grand Trunk Road, where only a ferry service used to ply at one time.

Almost all roads in the Indian sub-continent converge on or lead to Delhi—from Khyber to Kohima and Cape Comorin to Kashmir. Delhi is the biggest railway centre today in India, well-connected with almost every part of the country. Numerous railway lines connect the city with Bombay, Calcutta, Madras, Vishakhapatnam, Kandla, Ahmedabad, Barmer, Amritsar, Pathankot, Simla, Dehra Dun, Lucknow, and Gauhati.

No wonder then no other city in the country has played a greater role in the political life of this sub-continent.

EXERCISES

Review Questions

1. Answer the following questions briefly :
   - (*i*) What makes the study of distribution of man on the earth's surface an important part of geography?
   - (*ii*) In what way does man as an element of geography differ from most others?
   - (*iii*) State the three most important characteristic features of our present day world population?

(*iv*) How do social values, attitudes, religious beliefs, history and political considerations affect distribution of population ?

(*v*) Name the four large parts of the world most densely populated.

(*vi*) What is census? How does it help us?

(*vii*) Why did the world population grow very slowly for a very long time in the early periods of human history?

(*viii*) How would you explain certain high concentrations of population in the midst of certain very sparsely populated parts of the world?

(*ix*) Define population density and state how this concept is useful to us.

(*x*) What is urbanization? State its three important features.

(*xi*) In what respect does a metropolis differ from an urban centre?

(*xii*) Explain what is meant by average life expectancy. What is the average life expectancy in India today? Compare it with that of New Zealand.

(*xiii*) What is a ghost town? Give four good examples of the same from different continents.

2. State various factors affecting uneven distribution of population. Illustrate your answer with suitable examples from India and other countries.

3. What are the different functions of towns and cities? Explain each function with a suitable example.

4. State with illustrations, various locational factors that help a town to grow.

5. How would you account for the rapid pace of population growth during the last couple of centuries?

6. Make out correct pairs from the two columns:

(*i*) The very low population of Australia as a whole.

(*ii*) Marked difference between the population densities of Uttar Pradesh and Rajasthan.

(*iii*) The sharp contrast between the population of North and South Italy.

(*iv*) A high density of population in the Netherlands.

(*i*) Whereas the former is due to agriculture the latter is due to modern industry.

(*ii*) Mainly owing to difference in temperature.

(*iii*) Largely due to state policies and political considerations.

(*iv*) Sharp difference in soil fertility.

(*v*) Ideal location and facilities for promoting international trade.

(*v*) Very dense population in Belgium, Luxemburg and the Ruhr Basin.

(*vi*) Wide variation in the population densities of Java and Sumatra.

(*vii*) Exceptionally high density of population in the midst of sparsely peopled desert areas in the United Arab Republic.

(*viii*) Distinct reasons for high density of population in warm temperate eastern margins of Asia and North America.

(*vi*) Easy access to rich mineral resources.

(*vii*) Availability of water for irrigation.

(*viii*) Abundance of mineral resources.

(*ix*) Marked difference in rainfall.

(*x*) Soil fertility and a commanding position to engage in international, commerce.

(*xi*) Differences in terrain and soil fertility.

(*xii*) Primarily due to historical developments.

7. Complete the following statement by choosing the most appropriate ending:

Most of the lands around the North Sea are thickly populated because of

(*i*) the great fisheries which provide both food and employment.

(*ii*) the successful development of industries through the proper utilization of its vast mineral and power resources.

(*iii*) the moderating influence of the Gulf Stream on its climate.

(*iv*) the intensive and scientific method of agriculture practised in these lands.

(*v*) the long indented coastline studded with major ports often backed by navigable rivers and canals.

8. Make out the correct pairs from the four columns given below and complete the following table with appropriate entries against every town in the rest of the three columns. The entries relating to the city of Cairo have been star-marked to provide you with an example. (N.B. Please proceed column by column.)

Town	*Major Function*	*Significant Locational Factor*	*Important Characteristic Feature*
1. Cairo*	Military	Metallic/mineral deposits	A tourist resort
2. Chicago	Manufacturing	Spacious and safe harbour	Originally a river Island town, now spread out on either bank of the river.

3. Essen	Mining	Coal-field	A naval centre
4. Geneva	Commercial (mainly national)	The head of a large lake	A port-city
5. Istanbul	Cultural (Religious and educational)	The head of a* fertile delta	An old city
6. Kalgoorlie	Cultural (Arts, Literature, Fashion)	Mountain lake	A railroad city
7. New York	Administrative*	Narrow Strait	A steel town
8. Paris	Recreational	High bank of a river bend	Water supply from about 500 kilometres
9. Varanasi	Commercial (mainly international)	River confluence	An old city with an international airport*.

Prepare a similar table for the following towns: Delhi, Saugar, Bombay, Chandigarh, Jamshedpur, Kandla, Ooty, Madurai and Itarsi.

Finding Out

(*i*) Find out the total population of each state in India as it was in the year 1901 and 1961. First, arrange the states in order of their total population and then according to their density (1961).

(*ii*) "With rapid growth of population in a country like ours, the standard of living of the country as a whole is bound to fall unless there is far greater increase in national production and income". Collect facts and figures to assess for yourself where we stand. Hold a class discussion on the problem of the growing population of India and its implications.

(*iii*) Study the locational factors of a couple of urban centres in your neighbourhood and prepare an illustrated report of your findings.

Cartographic Work

(*i*) Draw a map of India showing the density of population.

(*ii*) Show graphically the total population and density for each state.

(*iii*) Select any town and draw a sketch showing the important locational and other factors responsible for its growth.

Picture Reading

(*i*) Study carefully the Pictures No. 2,3,17,19,22,25,27,39,44,64,70,74 and 75 and say which of these belong to the densely populated parts and which to the sparsely peopled regions of the world. Say, why?

(*ii*) Pictures included in the book represent various occupations and stages of technological development of man. Select four or five suitable pictures from the book and weave around them a story of man's technological progress.

Films Available

i. Figuring it Out. No. 312.954; 10 mins; Hindi/English; D.A.V.E.
ii. Arteries of the City. No. 385; 11 mins; English; D.A.V.E.
iii. Growth of London. No. 914.2; 23 mins; English; D.A.V.E.
iv. Growing Metropolis. No. 915.4; 12 mins; Hindi; D.A.V.E.
v. The Rock (Gibraltar). No. 1872; 16 mins; Hindi/English; B.I.S.
vi. Look at Life Under Your Feet. No. 2557; 10 mins; English; B.I.S.
vii. This is Tokyo. No. 138; 30 mins; English; J.I.C.
viii. Calcutta. No. 910.54; 23 mins; English; D.A.V.E.
ix. Paris and Versailles. No. 914.436; 15 mins; English; D.A.V.E
x. Darjeeling (In the Shadow of Kanchanjanga); No. 915.41; 11 mins; Hindi; D.A.V.E.
xi. Rome—City Eternal. No. 914.56; 11 mins; English; D.A.V.E.
xii. Ottawa on the River. No. 917.123; 18 mins; English; D.A.V.E.

Further Readings

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APPENDICES

APPENDIX I

Weights, Measures and Conversion Factors

Area

1 square kilometre = 100 hectares
1 hectare = 10,000 square metres
= 2.471 acres
1 square mile = 2.59 square kilometres
= 259 hectares
= 640 acres
(1 acre = 0.405 hectare)
0.386 square mile = 1 square kilometre

Yield per Unit Area

100 kilogrammes (or one quintal) per hectare = 40.46 kilogrammes per acre
1.000 kilogrammes (or one metric ton) per hectare = 405 kilogrammes (or 4.05 quintals) per acre

Density of Population per Unit Area

1,000 per square kilometre = 2590 per square mile
100 per square kilometre = 259 per square mile
10 per square kilometre = 26 per square mile
1,000 per square mile = 386 per square kilometre
100 per square mile = 39 per square kilometre
10 per square mile = 4 per square kilometre

Volume

1 cubic metre = 35.314 cubic feet
= 1.308 cubic yards

Liquid Measure

1 litre = 0.264 gallon
1 gallon = 4.546 litres

Weight

1 kilogramme = 1,000 grammes
= 2.205 pounds
1 metric quintal = 100 kilogrammes
1 metric ton = 1,000 Kilogrammes

Power

1 kilowatt (kW) = 1.341 horse power (hp)
1 kilowatt hour (kWh) = 1.341 horse power (hp)
1 horse power (hp) = 0.746 kiloWatt or kiloWatt hour

Crude Petroleum

1 barrel = 158.99 litres
= 0.159 cubic metre
1 cubic metre = 6.29 barrel

Coal Equivalents

1 metric ton of *Peat* = 0.5 metric ton of coal
1 metric ton of *Lignite* = 0.67 metric ton of coal
1 metric ton of *Coke* = 0.9 metric ton of coal
1 metric ton of *Crude* petroleum or *Shale* oil = 1.3 metric tons of coal
1 metric ton of *Motor* spirit, *Kerosene* or fuel oils = 1.5 metric tons of coal
1,000 cubic metres of *Natural Gas* = 1.33 metric tons of coal
1,000 cubic metres of *Manufactured Gas* = 0.6 metric ton of coal
1,000 cubic metres of *Refinery Gas* = 1.75 metric tons of coal
1,000 kiloWatt hours of *Electric Energy* = 0.125 metric ton of coal

Unit of Flow of Water

1 Cusec = A flow of 1 cubic foot (of water) per second.
= A flow of 0.028 cubic metre (of water) per second.

Unit of Railway and Air Traffic

1 Passenger-mile = 1.609 passenger kilometres
1 Metric ton-mile = 1.609 metric ton-kilometre
1 Pound-mile = 0.73 kilogramme-kilometre

APPENDIX II

Land Use in Some Countries

(*in million hectares*)

Country	*Year*	*Total area*	*Agricultural area*	*Forested land*	*Other area*
Argentina	1957	277.6	143.1	99.4	35.1
Australia	1962	770.4	476.6	32.4	261.4
Brazil	1957	851.1	126.7	517.9	206.5
Canada	1961	997.6	62.8	443.4	491.4
China	1954	976.1	287.3	76.6	612.2
Congo	1959	234.5	51.4	100.0	83.1
Ethiopia	1961	118.4	70.2	4.4	43.8
France	1962	55.1	34.5	11.8	8.8
India	1960	326.3	175.3	56.0	95.0
Indonesia	1954	149.1	17.7	90.8	40.6
Italy	1962	30.1	20.6	5.9	3.6
Israel	1962	2.1	1.1	0.1	0.9
Japan	1960	36.9	7.0	25.4	4.5
Malaysia	1962	33.2	5.6	25.4	2.2
Netherlands*	1962	3.4	2.3	0.3	0.8
New Zealand	1960	26.9	13.3	10.8	2.8
Nigeria	1958	92.4	21.8	32.0	38.6
Pakistan	1958	94.6	25.5	3.6	65.5
South Africa	1962	122.3	101.1	1.4	19.8
Sweden	1962	44.9	4.0	22.5	18.4
Switzerland	1962	4.1	2.1	1.0	1.0
United Arab Republic	1961	100.0	2.6	0.5	96.9
United Kingdom	1962	24.4	19.7	1.7	3.0
United States	1959	936.3	441.4	302.0	192.0
Soviet Union	1956	2240.3	599.7	880.3	760.3
West Germany	1962	24.7	14.2	7.1	3.4

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*Land area only. Total area up to low-water line (sea level at low tide) is 4.1 million hectares.

APPENDIX III

Irrigation in Leading Countries

Rank	*Country*	*Year*	*Irrigated Area (in million hectares)*
1	China	1960	74.0
2	India	1961	24.36
3	United States	1959	11.26
4	Pakistan	1957	11.07
5	Soviet Union	1962	9.49
6	Indonesia	1961	5.54
7	Iran	1960	4.65
8	Mexico	1960	4.25
9	Japan	1960	3.37
10	United Arab Republic	1961	2.48
11	Spain	1962	2.03
12	Thailand	1962	1.88
13	Argentina	1957	1.50
14	Chile	1957	1.36
15	Australia	1962	1.0

Percentage of Area Irrigated by Sources, in India

(1958-59)

Canals	*Wells*	*Tanks*	*Other Sources*	*Total*
41.3	28.8	20.2	9.7	100

APPENDIX IV

Climatic Data for Some Stations

T. Temperature in degree centigrade; Rf. Rainfall in centimeters

Station	*Location*	*Altitude in metres*	*J*	*F*	*M*	*A*	*M*	*J*	*Jy*	*A*	*S*	*O*	*N*	*D*	*Year*
Brussels	50°50′N.	99.98	T 2.2	3.3	5.6	8.9	13.3	16.1	17.8	17.2	15.0	10.8	5.6	3.3	10.0
	4°21′E.		Rf 7.1	5.1	5.9	6.6	6.3	6.9	8.6	7.4	7.1	8.1	7.9	8.1	84.1
Cairo	30°03′N.	115.82	12.8	13.9	17.2	21.1	24.4	26.7	27.8	27.8	28.6	23.3	18.3	14.4	21.1
	31°15′E.		1.0	0.5	0.5	0.5	—	—	—	—	—	—	0.2	0.5	3.3
Calcutta	22°38′N.	6.40	19.4	21.7	26.7	29.4	30.6	29.4	28.9	28.3	28.3	27.2	22.8	19.4	26.1
	88°21′E.		0.7	2.8	3.6	4.8	14.5	30.2	31.8	32.3	25.1	10.6	1.8	0.5	158.8
Colombo	7°1′N.	7.32	26.7	26.7	27.8	28.3	28.3	27.8	27.2	27.2	27.2	27.2	26.7	26.7	27.2
	79°58′E.		8.1	4.8	10.9	24.6	27.7	18.5	11.2	8.1	12.2	34.0	29.9	12.9	203.2
Hobart (Tasmania)	42°54′S.	53.95	16.7	16.7	15.0	12.8	10.6	8.3	7.8	8.9	10.6	12.2	13.9	15.6	12.8
	147°18′E.		4.6	3.8	4.6	4.8	4.6	5.6	5.3	4.8	5.3	5.8	6.1	5.3	61.0
Honolulu	21°19′N.	11.58	21.7	21.7	21.7	22.8	23.9	25.0	25.6	25.6	25.6	25.0	23.9	22.2	23.9
	157°50′W.		9.4	10.9	9.6	5.8	4.8	2.8	3.3	3.8	3.8	4.8	10.7	10.4	137.3
Kebete (Near Nairobi)	1°17′S.	1819.96	18.3	19.4	19.4	18.9	17.8	16.7	15.6	16.1	17.8	18.3	18.3	17.8	17.8
	36°50′E.		3.8	6.3	12.4	21.1	15.7	4.6	1.5	2.3	3.1	5.3	10.9	8.6	96.3
Kiev	50°24′N.	179.83	–6.1	–5.0	–0.6	7.2	13.9	17.8	19.4	18.6	13.9	7.8	1.1	–4.4	6.7
	30°28′E.		2.8	2.0	3.8	4.3	4.3	6.1	7.6	6.1	4.3	4.3	3.8	3.8	53.3
Lagos	6°27′N.	3.05	27.2	28.3	28.3	28.3	27.8	26.1	25.6	25.6	26.1	26.7	27.8	27.8	27.2
	3°28′E.		2.8	5.3	9.4	14.4	26.7	47.5	27.2	7.1	13.4	19.8	6.6	2.0	182.1

Contd.

Station	Location	Altitude in metres	J	F	M	A	M	J	Jy	A	S	O	N	D	Year
Manaus (Brazil)	3°06′S.	43.89	26.1	25.6	25.6	26.1	26.1	26.1	26.7	27.2	27.8	27.8	27.2	26.7	26.7
	60°00′W.		26.2	24.9	27.4	27.7	20.0	11.2	6.8	3.8	6.1	11.9	15.5	22.6	198.9
Ottawa	45°25′N.	79.25	–11.1	–10.6	–4.4	5.0	12.8	18.3	21.1	18.9	14.4	7.8	0.0	–8.3	5.6
	75°43′W.		7.4	5.6	7.1	6.8	6.3	8.9	8.6	6.6	8.1	7.4	7.6	6.6	86.9
Paris	48°52′N.	49.99	2.8	3.9	6.1	9.4	13.3	16.7	18.3	17.8	15.0	10.0	6.1	3.3	10.0
	2°20′E.		3.5	3.5	3.8	4.0	4.8	5.6	5.0	4.8	4.8	5.8	4.8	4.3	55.9
Rangoon	16°47′N.	5.49	25.0	26.1	28.9	30.6	28.9	27.2	26.7	26.7	27.2	27.8	26.7	25.0	27.2
	96°10′E.		0.5	0.5	0.7	3.5	30.6	46.7	54.5	50.0	39.1	18.5	7.1	0.7	253.0
San Antonio (Texas)	29°25′N.	213.66	11.7	13.3	17.2	20.6	23.9	27.2	28.3	28.9	26.1	21.7	16.1	12.2	20.6
	98°30′W.		3.8	3.8	4.6	8.3	8.9	6.6	5.8	4.0	7.4	5.8	4.6	4.6	68.0
Sao Paulo	23°33′S.	819.96	20.6	20.6	20.0	18.3	15.6	15.0	14.4	15.0	16.1	17.2	18.3	20.0	17.8
	46°39′W.		22.3	19.0	14.7	6.3	6.3	5.0	2.8	5.1	7.6	11.2	13.7	18.0	132.3
Winnipeg	49°53′N.	231.65	–20.0	–17.8	–9.4	3.3	11.1	16.7	18.9	17.8	12.2	5.0	–6.1	–14.4	1.7
	97°10′W.		2.3	1.8	3.0	3.5	5.1	7.9	7.9	5.6	5.6	5.6	2.8	2.3	51.3

APPENDIX V

Production of Milk and Other Dairy Produce in Some Leading Countries (1962)

Country	*Milk production in million metric tons*	*Annual milk yield per milking cow in kilogrammes*	*Butter in thousand metric tons*	*Cheese in thousand metric tons*	*Condensed and evaporated milk in thousand metric tons*	*Dried milk in thousand metric tons*
Australia	6.8	2,120	202	56	69	68
Brazil	5.5	**	30	40	22	53
Canada	8.8	2,960	169	83	159	114
Denmark	5.3	3,640	167	114	27 (1961)	30 (1961)
East Germany	5.4	2,450	160	42	18 (1961)	20 (1961)
France	24.7	2,360 (1961)	297	424	105 (1961)	123 (1961)
India*	20.9 (1961)	188	599 (1956)	**	**	**
Italy	10.4	2,050	63	348	10	9
Netherlands	7.3	4,230	102	224	435	82
New Zealand	5.4	2,740	214	102	15	60
Pakistan	6.3	420	112	**	**	**
Poland	12.9	2,140	164	185	**	10
United Kingdom	13.0	3,010	65	116	218	102
United States	57.1	3,340	715	988	1,532	1,206
Soviet Union	64.0	1,710	940	218	**	**
West Germany	20.5	3,440	472	321	424	131

* The figures are tentative for the year 1961. The milk yield per milking buffalo is 499 kilogrammes.
** Data not available.

UTILIZATION OF MILK IN INDIA

(*in thousand tons*)

Year	*Total milk production*	*Consumed as fluid milk*	*Milk converted into milk products*						
			Ghee	*Curds*	*Butter*	*Khoa*	*Icecream*	*Cream*	*Others*
1951	17,406	6,802	6,979	1,540	1,044	769	82	125	65
1956	19,717	7,711	7,850	1,786	1,174	895	92	143	66
1961	20,933	8,343	8,100	1,863	1,270	997	103	158	99

APPENDIX VI

Yields of Some Major Commodities (1961-62)

Commodity	*Leading Producer*	*Its Average Yield per hectare (in quintals)*	*Country with the highest yield*	*Its Average Yield per hectare (in quintals)*	*Average Yield in India per hectare (in quintals)*
Rice (Paddy)	China (1960/61)	27.0	Australia	66.2	15.2
Wheat	Soviet Union	10.6	Denmark	41.3	8.5
Corn (Maize)	United States	38.9	New Zealand	48.9	9.5
Sugar-cane	India	412.0	Hawaii	2023.0	412.0
Cotton (lint)	United States	4.9	El Salvador	9.7	1.0
Jute	Pakistan	15.2	Japan	20.0	12.5

APPENDIX VII

Agricultural Population of Some Countries

Country	*Year*	*Total population (in millions)*	*Agricultural population* (in millions)*	*Percentage of agricultural population*
Algeria	1948	8.4	6.0	71
Argentina	1952	18.0	3.7	20
Australia	1950	8.2	1.0	12
Cambodia	1958	4.7	3.3	70
Canada	1961	18.2	2.0	11
China	1950	547.0	377.1	69
Congo	1947	10.7	9.0	84
Ethiopia	1962	21.0	18.9	90
France	1962	45.3	8.4	18
Guatemala	1950	2.8	1.7	62
India**	1951	356.9	249.1	70
Iran	1960	20.2	12.1	60
Israel	1950	1.3	0.2	18
Italy	1948	46.0	20.0	44
Japan	1960	93.4	34.5	38
Netherlands	1960	11.5	1.2	10
New Zealand	1950	1.9	0.4	19
Norway	1960	3.6	0.7	19
Switzerland	1960	5.4	0.6	11
United States	1962	186.6	14.3	8
Soviet Union	1950	181.0	90.5	50
West Germany	1950	47.8	7.0	15
Yugoslavia	1961	18.5	9.3	50

* The agricultural population is generally defined as all persons who depend upon agriculture for a livelihood, that is to say, persons actively engaged in agriculture and their non-working dependents.

** Excluding the Punjab and Jammu and Kashmir for which data were not available.

APPENDIX VIII

Certain Important Per Capita Figures Relating to Economic Development of Some Leading Countries (1962)

Country	*Arable land in hectares*	*Consumption of energy in kilogrammes of coal equivalent*	*Consumption of steel in kilogrammes*	*Production of coal in kilogrammes*	*Production of cement in kilogrammes*	*Production of sulphuric acid in kilogrammes*	*Motor vehicles* in use per* 1000 *persons*
Australia	3.02	4,070	334	2,324	274	108	285
Brazil	0.25	367	38	33	67	2	14
Canada	2.25	6,015	345	392	334	84	309
China	0.16	561	20	600	13	2	**
France	0.46	2,591	318	1,114	359	47	169
India	0.35	161	14	135	19	1	1
Israel	0.17	1,398	172	—	416	52	30
Japan	0.06	1,388	242	573	303	52	27
Malaysia	0.65	260	37	—	38	—	18
New Zealand	0.26	1,957	192	286	254	—	286
South Africa	0.62	2,437	129	2,480	160	—	74
Switzerland	0.07	2,128	373	—	658	22	131
United Arab Republic	0.09	284	13	—	82	3	4
United Kingdom	0.14	4,948	332	3,754	267	52	152
United States	0.99	8,263	488	2,120	316	94	418
Soviet Union	1.04	3,046	334	1,745	259	28	**
West Germany	0.15	3,884	488	2,494	502	54	122

* Motor vehicles include passenger cars and commercial vehicles.

** Data not available.

APPENDIX IX

Railway Traffic in Some Countries (1962)

Country	*Passenger-kilometres (in millions)*	*Net ton-kilometres (in millions)*
Argentina (1961)	15,158	14,014
Australia	3,548	14,368
Brazil (1961)	16,855	11,922
Canada	3,249	99,186
China (1959)	45,670	265,260
Czechoslovakia	19,769	52,224
France	35,770	61,170
India	85,115	83,270
Italy	31,619	15,820
Japan	206,764	57,510
Nigeria	760	2,268
Pakistan (1961)	12,006	7,895
Poland	31,246	72,688
United Arab Republic	4,085	2,566
United Kingdom	31,820	26,333
United States	32,067	869,815
Soviet Union	189,300	1,646,300
West Germany	38,401	49,788

APPENDIX X

Air Traffic* in Some Countries (1962)

Country	*Passenger-kilometres flown (in millions)*	*Cargo** net ton-kilometres flown (in millions)*
Australia	3,387.3	89.7
Belgium	1,384.4	35.2
Brazil	3,147.9	111.0
Canada	5,508.8	62.2
Colombia	1,001.3	45.7
France	6,129.0	135.8
India	1,461.3	47.0
Italy	2,632.9	54.9
Japan	2,239.8	34.0
Mexico	1,190.9	35.9
Netherlands	2,847.4	126.9
Spain	1,236.1	9.4
Sweden	1,176.6	28.7
Switzerland	1,685.7	31.1
United Kingdom	8,759.7	174.9
United States	70,423.6	1,474.4
World***	130,000.0	2,920.0

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* The figures cover both domestic and international scheduled services operated by airlines registered in each country. Scheduled services include supplementary services occasioned by overflow of traffic on regularly scheduled trips.

** Cargo means all goods, except mail, carried for remuneration.

*** Excludes the figures of the countries that were not members of the International Civil Aviation Organization on December 31, 1962.

APPENDIX XI

Population of Cities With More Than a Million Inhabitants

City	*Country*	*Year*	*Population*
Alexandria	United Arab Republic	1959	1,335.000
Cairo	—„—	1959	2,852,000
Montreal	Canada	1956	1,109,439
Mexico D.F.	Mexico	1960	2,697,994
Chicago	United States	1960	3,550,404
Detroit	—„—	1960	1,670,144
Los Angeles	—„—	1960	2,479,015
New York	—„—	1960	7,781,984
Philadelphia	—„—	1960	2,002,512
Buenos Aires	Argentina	1958	3,767,887
Rio de Janeiro	Brazil	1959	3,123,984
Sao Paulo	—„—	1960	3,674,373
Bogota	Colombia	1959	1,123,600
Lima	Peru	1960	1,262,107
Caracas	Venezuela	1959	1,136,000
Canton	China	1957	1,840,000
Chengtu	—„—	1957	1,107,000
Chunking	—„—	1957	2,121,000
Harbin	—„—	1957	1,552,000
Nanking	—„—	1957	1,419,000
Peking	—„—	1957	4,010,000
Port Arthur and Dairen	—„—	1957	1,508,000
Shanghai	—„—	1957	6,900,000
Shenyang (Mukden)	—„—	1957	2,411,000
Sian (Hsi-an)	—„—	1957	1,310,000
Taiyuan	—„—	1957	1,020,000
Tientsin	—„—	1957	3,220,000
Tsingtao	—„—	1957	1,121,000
Wuhan	—„—	1957	2,146,000
Hong Kong	Hong Kong	1956	1,000,000

City	*Country*	*Year*	*Population*
Ahmedabad	India[2]	1961	1,149,918
Bangalore	—„—	1961	1,206,961
Bombay	—„—	1961	4,152,056
Calcutta	—„—	1961	2,927,289
Delhi	—„—	1961	2,323,303
Hyderabad	—„—	1961	1,251,119
Madras	—„—	1961	1,729,141
Djakarta	Indonesia	1959	2,814,210
Surabaya	—„—	1959	1,146,641
Teheran	Iran	1960	1,838,982
Kobe	Japan	1959	1,086,000
Kyoto	—„—	1959	1,254,000
Nagoya	—„—	1959	1,502,000
Osaka	—„—	1959	2,887,000
Tokyo	—„—	1960	8,302,565
Yokohama	—„—	1959	1,302,000
Pusan	South Korea	1958	1,097,000
Seoul	—„—	1958	1,646,000
Karachi	Pakistan	1961	1,916,000
Manila	Philippines	1960	1,145,723
Saigon	South Vietnam	1959	1,383,000
Wien	Austria	1959	1,656,292
Paris	France	1954	2,850,189
Hamburg	West Germany	1959	1,815,399
Munich	—„—	1959	1,047,668
East Berlin	East Berlin	1959	1,085,000
West Berlin	West Berlin	1959	2,221,349
Budapest	Hungary	1960	1,807,299
Milan	Italy	1951	1,260,490
Rome	—„—	1951	1,555,773
Warsaw	Poland	1960	1,136,000
Bucharest	Rumania	1959	1,227,111

City	*Country*	*Year*	*Population*
Barcelona	Spain	1940	1,079,601
Madrid	—,,—	1940	1,088,647
Birmingham	United Kingdom	1959	1,091,500
London	—,,—	1958	3,225,000
Glasgow	—,,—	1959	1,076,614
Leningrad	Soviet Union	1959	2,888,000
Moscow	—,,—	1959	5,032,000

[1] The population figures for all the cities are for the city proper, that is the area under the city administration.
Source—United Nations Demographic Yearbook, 1960.

[2] Source—Statistical Abstract of the Indian Union, 1963-1964.

APPENDIX XII

Film References and Further Readings

A brief note on "Films Available" has been given at the end of each chapter. In each case the title of the film is followed by a procurement number if any, the length of the film in terms of screening time, the language in which the commentary is made and the name of the agency which loans the film. The name of the agency is given in abbreviation. The full name and address of agencies and their branches are given below to help schools to procure the films mentioned. It is further expected that a teacher would preview the film before it is shown to the class, prepare the class to understand its theme and finally, would follow up the film-show by a class discussion on the contents of the film.

1. A.H.C. : Australian High Commission (Public Relation Section), 9/48, Sardar Patel Road, New Delhi.

2. B.I.S. : British Information Services, Film Library.

New Delhi—Chanakyapuri, New Delhi-21.

Bombay—Mercantile Bank Building, Mahatma Gandhi Road, Fort, Bombay-1.

Calcutta—1 Harington Street, Calcutta-16.

3. C.H.C. : Canadian High Commission, Film Library, 13, Golf Links, New Delhi-3.

4. Embassy of the Federal Republic of Germany : 6/50, G, Shanti Path, Chanakyapuri, New Delhi-11.

5. J.I.C. : Japan Information Centre, 10, Curzon Road, New Delhi.

6. D.A.V.E. : Department of Audio-Visual Education, Central Film Library, Indraprastha Estate, Ring Road, New Delhi.

7. R.D.E. : Royal Danish Embassy, 6, Golf Links, New Delhi.

8. R.N.E. : Royal Norwegian Embassy, Koutilya Marg, Chanakyapuri, New Delhi-11.

9. U.S.I.S. : United States Information Service, Film Libraries.

New Delhi—U.S. Information Service, Bahawalpur House, Sikandra Road, New Delhi-1.

Bombay—U.S. Information Service, Film Section, Fazalbhoy House, Marine Lines, Bombay-1.

Calcutta—U.S. Information Service, Film Section, Flat No. 3, Esplanade Mansions, Calcutta-1.

Madras—U.S. Information Service, 158, Mount Road, Madras-2.

Lucknow—American Cultural Centre, 4, China Bazar Road, Lucknow.

Hyderabad—American Cultural Centre, Hussani Building, Mukkaram Jahi, Road, Hyderabad.

Patna—American Cultural Centre, South West Gandhi Maidan, Patna-1.

Bangalore—American Cultural Centre, Sri Narasimharaja Square, Bangalore.

Trivandrum—American Cultural Centre, TC 1178, Main Road, Cantonment, Trivandrum.

Guntur—American Cultural Centre, Hospital Road, Guntur.

Listed at the end of each chapter are the references for further reading. In each case the name of the author, title, publisher, place and year of publication, and the actual numbers of the pages having a bearing on the topic discussed in the text have been given. These may be used as collateral readings for further enrichment of students. The books with an asterisk mark are essentially meant for the use of teachers. However, he is expected to be familiar with the other books as well. The books mentioned below are meant for general reference.

Stamp, L.D., *A Glossary of Geographical Terms.* Longmans, Green and Co. Ltd., London, 1961.

Moore, W.G., *A Dictionary of Geography.* Penguin Books Ltd., Harmondsworth, Middlesex, 1959.

Government of India, *School Atlas.* Map Publication Office, Survey of India, Dehra Dun, 1964.

Parakh, B.S., *Functional Assignments in Geography.* National Council of Educational Research and Training, Delhi, 1961. (A non-priced publication and can be had from the Publication Unit, National Council of Educational Research and Training, B-31, Maharani Bagh, New Delhi 14.)

GLOSSARY

Agriculture—The science and art of cultivating the soil, raising crops, and rearing livestock. It is also called farming.

Alloy—A mixture of two or more metals. For example, brass is an alloy of copper and zinc.

Anthracite—A lustrous, hard, compact variety of natural coal containing 85 to 95 per cent of carbon. It burns slowly and is smokeless.

Arable land—Land which can be cultivated with a plough. It is also called cultivable land and includes both cultivated and temporary fallow land.

Atomic energy—Power obtained by splitting the atom under controlled conditions. As the power is derived by bringing about a change in the nucleus of an atom, it is also known as nuclear energy.

Balance of trade—The difference between the total value of a country's exports and imports. An excess of export over import makes a favourable balance of trade, and the converse an unfavourable balance.

Barter—A direct exchange of excess produce between two parties to the mutual advantage of both, without the use of tokens, credit, or money in the transaction.

Basic industry—Industries such as iron and steel and chemicals like sulphuric acid that are fundamental to other industries. Sometimes the term is also used to include heavy industries of national importance.

Bituminous coal—The most common and useful variety of soft natural coal containing about 70 to 90 per cent of carbon. It includes coking coal, steam coal, gas coal and bunker coal.

Blast furnace—A furnace in which a current of very hot and compressed air is used to force combustion in the melting of ores.

Broadcast sowing—Sowing seeds by scattering them in all directions, on the plot of land prepared for cultivation.

Census—Official enumeration of population along with certain economic and social statistics in a given territory.

Chemical fertilizers—Substances of natural or artificial origin containing chemical elements such as phosphorus, potassium, and nitrogem that are necessary to plant life. They are added to the soil for increasing its productivity.

Coal tar—A black, oily liquid obtained in the manufacture of gas or in the making of coke from coal.

Coke—Solid and strong black substance with a high carbon content, left after volatile parts have been distilled from coal.

Contour ploughing—Tilling or ploughing hillsides or sloping lands along the contour lines, that is, around rather than up and down a slope mainly with a view to conserving soil and water.

Dairy farming—A kind of agriculture in which major emphasis is on breeding and rearing milch cattle. Agricultural crops are raised mainly to feed these cattle.

Density of population—The average number of inhabitants living within a specified unit of area, such as a square kilometre or a square mile.

Diversified agriculture—A type of farming which involves the raising of many different kinds of crops and livestock.

Dock—A platform built on the shore or out from the shore where ships can be berthed for loading and unloading.

Drifters—Slow-moving boats or light fishing ships used for catching surface-swimming fish with the help of nets hanging like curtains in the water close to the surface.

Dry farming—A method of farming adopted in certain regions of inadequate rainfall and devoid of irrigation facilities by conserving moisture in the soil and by raising drought-enduring crops.

Early Bird—An artificial communication satellite in space which remains stationary in relation to the earth as it revolves round it with the same speed as that of the earth. It is capable of effectively reflecting radio waves and hence it enables us to transmit easily and economically intercontinental telecommunication and television programmes.

Economic Geography—The aspect or branch of geography which deals with the influences of the environment, both physical and cultural, on the economic activity of man, bringing out similarities and differences from place to place in the ways people make a living.

Environment—Surroundings or the conditions under which a person or thing exists and develops his or its character. It covers both physical and cultural elements.

Exports—Goods despatched from one country to another.

Extensive agriculture—Farming in which the amount of capital and labour applied to a given area is relatively small.

Fallow land—Arable land lying uncultivated for one season or more.

Fazenda—A coffee plantation in Brazil.

Ferro alloys—The minerals combined with iron and steel in small proportions to give it greater strength to a required degree. They are: manganese, tungsten, nickel, cobalt, chromium, vanadium, and titanium.

Fibre—A substance composed of thread-like tissues capable of being spun and woven. Jute, cotton, flax, and hemp are fibre crops, representing plant-fibre; and silk and wool are animal fibres. Nylon and rayon developed artificially are known as synthetic fibres.

Fisheries—The act of catching animal life from water, *viz.*, trapping salmon, harpooning whales, diving for sponges and pearls, digging clams out of mud, and shooting seals. Also refers to places where fish exist in great numbers and are caught on a large scale.

Fish farm—Hatcheries of fish where more productive and useful varieties of fish are seasonally stocked, carefully fed, and caught in a controlled manner.

Fishing banks—Shallow ocean waters generally located on continental shelves in cool mid-latitude regions where comparatively few species of fish are present in vast numbers.

Foreign exchange—The mechanism or process by which payments between any two places operating under different national currency systems are effected without passing of actual money, or gold, etc.

Freeways—The wide highways on which cross-roads are avoided by providing overhead links where one turns in only one direction to ensure smooth and speedy traffic.

Fresh-water fisheries—Fishing in fresh-water bodies such as lakes, ponds and rivers that are generally located near densely populated areas.

Ghost towns—Once flourishing mining towns that have been deserted now because of the exhaustion of the mineral resources that could be exploited economically.

Grasslands—Regions of the world where the predominant natural vegetation is grass and other herbaceous plants with a few trees here and there. Whereas the tropical grasslands are called the savannas, the temperate grasslands are called the prairies and the steppes.

Growing season—Part of a year in a given region when the growth of vegetation or crops is made possible by a favourable combination of temperature, precipitation, and freedom from harmful frost. The duration of the growing season generally decreases with the distance from the equator.

Harbour—An extensive stretch of deep water where vessels can anchor securely to obtain protection from sea and swell either through natural features or artificial works.

Hardwood—Timber obtained from various types of broad leaved or deciduous trees.

Heavy industry—An industry characterized by the heavy and bulky nature of raw material and finished products and much concerned with transport costs.

Highway—Public road connecting distant places. Such a road of national importance is called a national highway.

Horticulture—Cultivation of vegetables, fruits or flower crops; often on small plots, involving higher intensiveness than in field cultivation.

Hydro-electricity—Electricity produced by the application of the motive power of water.

Imports—Goods brought into a country from another country.

Industrial Revolution—The change in manufacturing from hand-operated tools to power-driven machinery, began in England during the middle of the eighteenth century.

Industry—Systematic production characterized by division of labour and extensive use of machinery.

Ingot—A mass of metal which has been temporarily cast into some convenient shape for storage or transportation, to be remoulded later for making necessary products.

Intensive agriculture—Farming in which large amounts of capital and labour are applied per unit area of land, in order to obtain high yield.

Intensive commercial agriculture—A type of intensive farming whose quality products such as fruits, vegetables and flowers enter into national or international trade.

International trade—Trade carried on between nations primarily to exchange their surpluses and make up their deficits.

Kharif—Crop sown soon after the onset of the southwest monsoons in India (June, July) and harvested in autumn.

Light industry—Secondary industries which do not come under the definition of heavy industry, and can employ a considerable proportion of female labour, if available.

Lignite—A variety of brown coal showing more readily its vegetal origin. It contains about 40 per cent of carbon and considerable amount of moisture. It is intermediate in properties between bituminous coal and peat.

Liner—Fast-moving big oceanic ships operating to schedule on regular routes. They carry passengers and mail, as well as goods required to be moved faster.

Lock—A stretch of water in a canal or a river enclosed by gates with sluices to enable ships to be raised or lowered from one water-level to another.

Lumbering—A basic occupation of cutting timber in forests. It includes varied activities such as logging, splitting, and hauling.

Metropolis—A very large city or agglomeration of population in a district or a country, and is often a chief centre or seat of some form of activity—administrative, commercial, or industrial. It generally serves a large metropolitan area or hinterland.

Mine—An excavation made in the earth for digging out minerals such as coal, iron-ore and precious stones. A mine usually denotes underground working, except in open-pit mines.

Mineral—A substance that is found in the earth's crust, and which generally has a definite chemical composition—unlike most rocks.

Mineral fuel—Non-metallic minerals such as coal and petroleum which are used as fuel.

Mineral oil—A mixture of hydrocarbons in solid, gaseous, or liquid form found in the earth. It is commonly known as petroleum. It became a commercial product only in 1859.

Mineral ore—Metals in their raw state as extracted from the earth.

Mining—An economic activity concerned with the extraction of commercially valuable minerals from the bowels of the earth.

Mixed farming—A type of farming in which cultivation of crops and raising livestock go hand in hand. Both these activities play an important part in the economy.

Mohair—Long silky wool obtained from the coat of the Angora goat.

Natural gas—Free hydrocarbons in a gaseous state usually associated with crude mineral oils and found in the earth' crust in a natural state.

Natural resources—Wealth supplied by nature—mineral deposits, soil fertility, timber, fuel, water, potential water-power, fish and wild life, etc.

Nomadism—A way of life of the people who are required to shift their dwellings frequently from place to place in search of pastures for their animals—the mainstay of their economy.

Oilfield—An area where oil is drilled.

Open-pit mine—A place where soil and overburden are first removed and a mineral or ore is extracted by quarrying. In a way it is a quarry on a large scale. This method of mining is known as opencast mining.

Pastoralism—An economy that solely depends upon animals. Whereas nomadic pastoralism is practised mainly for subsistence, the modern ranches present an example of commercial pastoralism.

Pig-iron—Iron that is solidified in oblong masses as soon as it flows from the blast furnace. It gets its name because of the moulds that look like "pigs" in which it is allowed to solidify.

Plantation agriculture—A large-scale one-crop farming resembling factory production. It is usually characterized by large estates, huge capital investment, and modern and scientific techniques of cultivation and trade.

Port—The commercial part of a harbour containing facilities for embarking and disembarking passengers, loading and unloading, and some facilities for the storage of cargo.

Prairie—A level or undulating land devoid of trees and covered with a contiguous mat of tall grass in semi-humid temperate region, especially in North America.

Primary industry—Activities concerned with collecting or making available materials, provided by nature, for example, agriculture, fishing, forestry, hunting or mining.

Quarry—An open-air excavation from which stone is obtained by cutting, blasting, etc.

Rabi—A crop sown in India in winter and harvested in spring.

Ranches—Large stock farms, usually fenced in, where animals are bred and reared on a commercial scale. They are found especially in the United States.

Retting—A process of partial decay to make easy the separation of fibres. For example, Coconut husk, jute, flax, and hemp are soaked in water to allow partial decay.

Rotation of crops—A systematic succession of different crops on a given piece of land carried out in order to avoid exhaustion of the soil.

Secondary industry—Industry which transforms the material provided by primary industry into commodities more directly useful to man. It can be heavy industry, light industry, or even basic industry.

Sedentary agriculture—Farming practised more or less permanently on the same piece of land; the same as settled agriculture.

Sericulture—Rearing of silkworms and producing raw silk.

Shaft mine—An underground excavation made deep into the earth for digging minerals and mineral ores like coal, precious stones and iron. Such mines contain vertical and inclined shafts and horizontal tunnels at various levels.

Shifting agriculture—A method of farming in which a patch of ground is cultivated for a period of few years until the soil is partly exhausted or overrun by weeds, and after which the land is left to natural vegetation while cultivation is carried on elsewhere. In due course, the original patch of land is cultivated again when the natural growth has restored fertility.

Slag—A light substance containing waste and impurities after the molten metal is separated from the ore in a furnane. Being light, it floats on the top of molten metal.

Smelting—The process of melting ore in order to separate its metallic content.

Softwood—Timber obtained from various species of coniferous trees such as pine, fir, and spruce.

Steppe—A vast, comparatively level, and treeless plain of south-eastern Europe and Siberia. It consists of a contiguous mat of short grasses and represents semiarid climatic conditions.

Strip cropping—A method of farming, followed in certain semi-arid areas, in which there are long, narrow strips of cultivated lands, mostly along the contour lines, alternating with other strips that are tilled, but not planted. It helps in conserving moisture and soil.

Subsistence agriculture—Farming in which its produce is mainly consumed in the farmer's household—unlike commercial agriculture whose products enter into trade on a very large scale.

Tera-roxa—A deep porous soil containing considerable humus as reflected through its dark reddish purple colour. It is found on the Parana Plateau in Brazil.

Textile industries—Manufactures of fibrous raw material which is processed through spinning and weaving.

Trailer—A mobile structure having all the necessary conveniences of a house and is attached to a car that can be parked in trailer parks which supply gas, water, electricity, etc.

Tramp—Slow-moving large, ocean-going ships that visit any port where cargo can be obtained. They thus do not follow regular routes or any fixed schedule of sailing.

Transhumance—A seasonal movement of livestock and herdsmen from and to the mountains or between the regions of differing climates.

Transport—The action of carrying persons and goods from one place to another.

Urbanization—A general movement of people from small rural or agricultural communities or villages to larger towns engaged in varied activities such as government, trade, transport, and manufacture. It also indicates the concentration of an increasing proportion of total population in towns and cities.

Whaling—A special kind of deep sea operation carried out especially in sub-polar seas for killing whales for their meat and oil. (Whales are large mammals unlike fish.) The modern ships used for the purpose are known as whalers; they are floating factories which process and pack meat and oil for sale.

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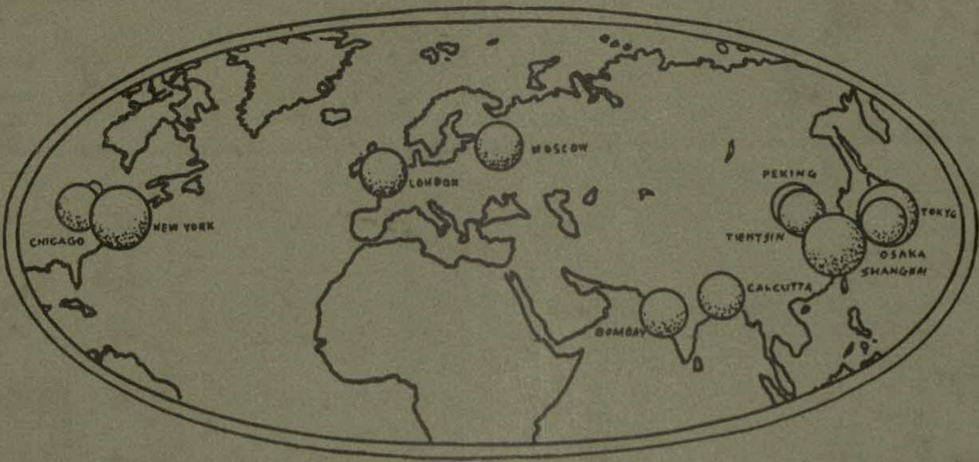
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